THE

Practical Teacher

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'Knowledge is proud that he has learned so much,
Wisdom is humble that he knows no more.'—COWPER.

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Health at School.

No. II.—SITE OF SCHOOL.

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HAVING made a few introductory remarks for the purpose of showing the wider scope of the subject of 'Health at School' than is generally understood by the term, and having pointed out that there is something to be done besides preventing the extension of infectious disease among school children, or even the prevention of that kind of disease which arises from the mere aggregation of numbers in close quarters, I will now proceed to discuss the particular points towards which attention should be especially directed. It must be borne in mind that the class for whom we are providing are of that age which is peculiarly susceptible to the influence of bad hygienic surroundings, and that it is especially necessary that a school-house should be constructed on the best possible hygienic principles. These in the first place resolve themselves into questions connected with the site of the school buildings and their immediate surroundings, such as—(1) their position with regard to other buildings and land in close proximity to them, and other portions of the same district; (2) the level of the land upon which they are placed; (3) the nature of the soil itself, especially that of the mother or virgin earth, the term virgin being applied to ground which has not been previously disturbed, at least in historic times; (4) the condition as to natural drainage, or the ordinary level of underground water.

It should be a *sine qua non* that no school-house should ever be built upon ground which has been raised from some former level, or has been 'filled up' with soil containing organic matter. Holes (either in the past or present) with notices up that 'Dry rubbish may be shot here' should be religiously avoided. If from the very nature of things it is utterly impossible to get any other site, then the whole of the superadded earth should be taken out down to the level of the virgin soil; for we have to consider the atmosphere which is likely to pervade the subsoil, as well as that of the air above the so-called *terra firma*.

This view of the subject is intimately associated with the level of the ground water in the subsoil. These points are connected with situation, and if not taken into account, may seriously interfere with the proper ventilation of the school, and render good health impossible. The nature of the materials with which the school is to be erected, and the elevation at which the school-house should be placed from the ordinary level of the earth, are also to be taken into account. I have seen the organic matter removed in a great measure, and the excavation used as a playground beneath the building, without any provision being made for the removal of the ground air from the hole. That ground air has been, from the very nature of circumstances, about the worst that it was possible to provide for the children to inhale. In that case, one evil was removed, but not the other. The soil around teemed with organic debris, and as a consequence deteriorated the atmosphere of the pit rather more than it was before the subsoil was taken out. In the one case the debris occupied a portion of the room, and the sum total of carbonic acid was rather less in the ground air before removal than after. It would have been better to have built upon it than only excavate. Certain kinds of materials used for construction, and some kinds of arrangements in the building of schools, render them much more capable of being effectually ventilated and warmed, as well as of being kept perfectly dry, than others in which different plans have been adopted, and the suggestions now made are some of them intended to promote the more easy and less expensive plans which will have to be adopted for proper warming and ventilation.

Returning to our subject of site, we must look at it in two ways:—(1) The choice of a site for a new school when the choice is open to us. (2) The way in which to diminish to the smallest possible amount the evils which must be endured, and to decrease the effects of their incidence in any particular case when no really satisfactory site can be obtained.

We have to find out (1) the nature of the subsoil and the quantity of organic matter which it contains, whether it is so-called 'made ground;' (2) the

level at which the subsoil or ground water ordinarily stands with regard to the surface, whether it is constant in its position, or varies much with the seasons, or is influenced by other causes. No school ought to be erected on any particular site until these points have been satisfactorily settled. If the line of the ground water rises and falls at frequent intervals, be the subsoil what it may, it cannot be a satisfactory site for a school; and if, in addition to this rise and fall of the ground water, the subsoil is organic in its nature, or is likely to be invaded by water containing organic matter in suspension or solution, it will be quite impossible by any arrangements whatever to prevent that school, at times, from being invaded by impure air, and thus presenting to the children assembled therein, or at least in the playground surrounding it, an atmosphere which will tend to diminish their general health.

Before settling upon a site for a school, if these points cannot otherwise be certainly determined, trial holes should be dug until the level of the ground water line is reached, unless the proposed site is a rock or in such a position that no ground water is likely to be found within a considerable distance from the surface. The level of the water line should be watched, and it should be noted if it be stationary or not, for in some districts this water line is found to vary very constantly.

The trial hole will also inform the promoters as to the character of the subsoil. The condition of the ground air is almost as important as that of the atmosphere around the school. It is a point which is not usually considered, and yet it is certain that the condition of the air in the subsoil will materially influence the health of the children. The quantity of air below the level of the soil will be more or less according to the porous nature of the soil itself; it will be in many cases equal to half the volume of the soil. When the level of the ground water rises, the air is naturally displaced upwards; and if the soil in which the air has stagnated be loaded with organic matter, it will be so altered from its natural character as to seriously and injuriously affect the children exposed to its influence.

The air in the subsoil is comparatively stagnant, and whilst that above ground only contains at the most four parts in 10·000 of carbon dioxide, that which is taken from below the level of the soil will often contain 4 p. c. or even 6 or 8 p. c. of that deleterious gas. This is one of the results of stagnation: the oxygen is removed, organic matter is oxidized, and carbon dioxide (or carbonic acid, as it is more commonly called) takes its place. Stagnation is the bane of health, and whether it be in air or in water, stagnation allows time for adulteration with injurious compounds. Such is the case with ground air: there is always a much greater quantity of carbon dioxide in it than in natural air. It forms an atmosphere which is very beneficial to the vegetable kingdom, but is just as injurious to human life. This impurity is much greater in the ground air than in the ground water; it will vary according to the nature of the subsoil, and whatever organic matter may exist in the latter, the whole will in the course of time be reduced to simpler elements of which carbon dioxide is sure to be one. Thus it happens that the more organic matter a given subsoil contains, the more injurious it is for that subsoil to be allowed to remain beneath the floor of any school buildings. If from the very circumstances of the case it is necessary for some such to be left *in situ*, arrangements must be made to disperse those products into the surrounding atmosphere, and to prevent them from finding their way within the area which is enclosed by the walls of the buildings. It is for this reason that it is far better for playgrounds to be turfed than covered with gravel. The vegetable kingdom is the natural protector against excess of carbon dioxide in the air.

It is important for all reasons that the level of the ground water should be uniform when it is less than fifteen feet from the surface of the earth. This uniformity can be effected, at least as regards a rise above a given level, wherever there is any regular system of drainage at hand. But it sometimes happens that a considerable extent of ground has the subsoil water raised by occasional inundations by reason of unusually wet seasons and from imperfections in natural drainage. There is always a slow movement of this water in the earth, but not sufficiently rapid to prevent the oxidation I have mentioned. It brings with it impure organic matters from a distance, and if in its progress it comes into contact with a mass of matter more than ordinarily dry, such as must exist beneath the area of any large building, the very part in which the most injury can be done is precisely that part which attracts the larger portion of organic matter from the water; and as the water line subsides, it leaves its organic matter behind it, and lays the foundation for future evils which are totally unsuspected. These underground inundations produce results which correspond with those which arise in recently-drained districts. It is only within the last few years, partly by observations in this country, but more decidedly by those made in Munich and in America, that the influence of ground air and ground water upon the public health has been demonstrated to be great. A few years ago our soldiers had frequently to live on the basements of their barracks, with the natural result of ill health and high mortality, and it is only recently that the occupation of cellars as lodging-houses has been prohibited by law.

If the level of the ground water line is moderately constant, even if it be within a few feet of the surface of the land, it is not nearly so injurious as when it rises and falls occasionally. This explains some of those anomalies which occasionally surprise us. It is sometimes seen that some places in which the level of the water is always within two feet of the surface are more healthy than others which are farther from the banks of a given stream. Those districts which have the misfortune to be placed above and yet within the influence of a mill-dam in a porous soil, especially when the mill-lead belonging to it does not rapidly fill, are much more unhealthy than those placed below the dam, and where the level of the ground water does not vary, although apparently it is the moister position of the two. The permanent level of the subsoil water should be kept as low as possible, and the soil should be so arranged (if it be porous), by means of subsoil drainage, that air should have free admission to it.

Evil results are more marked in a sandy or gravel soil, when these matters are not attended to, than in those sites in which the soil is more retentive. If

the level of the ground water cannot be regulated, it is better to choose a more retentive soil; but if soakage does take place, it is much more difficult to remove it from an argillaceous or retentive soil than from sand or gravel: the former also will be colder than the latter, from the continuance of evaporation, and then the cost of warming will be increased.

Anecdotal Natural History.

No. II.—THE CAMEL.

BY REV. J. G. WOOD, M.A., F.L.S.,
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THE place of the horse is supplied, and more than supplied, in the East by the Camel, the 'Ship of the Desert,' as the Arabs poetically term it, whose structure is singularly adapted to the nature of the country which it has to traverse. A horse could not pass through the sandy deserts, beneath the fierce heat of a tropical sun, bearing the heavy load of the camel, and dispensing almost entirely with food and water, especially the latter, for days together; and would, in fact, find it by no means easy, even if entirely unencumbered, to make its way through the treacherous soil, in which it would sink for several inches at every step. But the camel has evidently been constructed with an especial view to the exigencies of the desert traffic, and can therefore perform work which would be quite impossible to any other animal.

Halt in the Desert.

There are two species of camel, the chief of which is the true camel of Arabia, bearing one hump only upon its back. This is the animal most in use as a beast of burden. The second species, the Bactrian camel, or Mecheri, which possesses a second hump, is almost entirely used for riding purposes.

Now, when we consider the nature of the soil over which the Arabian camel has to pass, it is evident that there must be some provision in the foot of the creature in order to enable it to find a firm foothold. So, instead of the single hard hoof which is found in the horse, the foot of the camel is provided with two broad toes, furnished with large, soft, and very elastic cushions beneath, so as to afford a large surface, and prevent the animal from sinking in the loose sand.

Then, as the animal must be loaded and unloaded when in a kneeling position, the knees and breast are furnished with thick callous pads, so that the skin is not injured by the contact with the rough ground.

A curious part of the structure of the camel is found in the hump, which is not, as many think, a malformation of the back, for the spine is as straight as that of any other animal, but is merely a fleshy and fatty protuberance, connected in some strange way with the health of its owner. The Arab always judges the state of his camel by the hump, and will not allow the animal to start upon a long journey unless the hump is in perfect condition.

The chief use of the hump seems to lie in its power of nourishing the animal when other food is scarce. During a long desert journey, for example, the camels are very sparingly fed, and appear to subsist upon the nourishment derived from the hump, which gradually diminishes in size, until at the end of the journey it is scarcely visible, not regaining its former proportions until after two or three months of careful feeding.

In a somewhat similar manner, the hibernating animals exist without food for several months. They accumulate a quantity of fat largely in excess of the normal amount, and by the absorbing of the superabundant fat into the body, are enabled to supply the waste of tissue.

Another noticeable point in the structure of the camel is to be found in the formation of the eyes and nostrils, the former of which are provided with long lashes, while the latter can be closed at will, thus preventing the admission of grains of sand during the storms so common in the desert.

Perhaps the most extraordinary part of the formation of the camel lies in its power of storing up sufficient water within the stomach to last it for several days without again drinking. To understand this properly, we must enter somewhat more carefully into the details of the internal anatomy.

Like that of the sheep and other ruminating animals, the stomach of the camel is divided into no less than four portions, which, though each is a separate cavity, are connected with each other. Into the first and largest of these, usually known as the paunch, or *rumen*, the food passes as soon as swallowed, and before it is masticated. There it remains until a convenient opportunity arises for chewing it, when it is returned to the mouth and thoroughly macerated. Before this process takes place, however, it passes into the second stomach or *reticulum*, which consists of a number of polygonal cells, in which the food is formed into a number of smooth balls. This is the 'honeycomb tripe' of butchers. Thence it is expelled into the œsophagus, or gullet, which opens both into the

first and second stomachs, and is carried by the contraction of the spiral muscles composing that tube into the mouth, where it is masticated at leisure.

As soon as it is thoroughly chewed, the food is once more swallowed, and this time passes directly through the first and second stomachs into the third, or *psalterium*, the walls of which are composed of very numerous folds, not unlike the leaves of an uncut book. This is the 'manyplies' or 'manyplus' tripe of butchers, presenting a very large surface to the food which is here prepared for admission to the fourth stomach.

This, which is scientifically known by the name of *abomasus*, and by butchers called the 'red,' is the true digestive stomach, the other three being only employed in the prior preparation of the food. In this division of the stomach the gastric juice is secreted. In the calf it is called 'rennet,' and is used for curdling milk in the preparation of cheese.

While the animals of this class, the Ruminants, are still young, and are fed by their mother's milk, the fourth

Arabian Camel.

stomach only is fully developed, the other three not being required until the animal is old enough to find its nourishment in vegetable substances.

This structure is common to all the ruminating animals, but in the camel there is found to be a still further development. The polygonal cells which are found in the reticulum, and in part of the paunch, are very large in proportion, and are surrounded by muscular bands, enabling them to be closed at will, their contents not mingling with the food contained in the stomach. In these cells is reserved the water drunk by the animal, a small quantity of which can be released and allowed to flow into the stomach as occasion requires, the rest remaining in the reservoirs until needed. By this arrangement a camel is able to store up sufficient liquid for six or seven days, a provision of the greatest service in crossing the hot arid desert where water is unprocurable.

It would seem that by practice the camel is enabled to store away a larger quantity of water than had previously been the case, for an old and experienced animal will contrive to lay up half as large again a stock as it could when young and unused to desert travelling.

It has sometimes happened in a caravan that the water has run short, and the only alternative has been to kill some of the camels in order to obtain the water contained in their stomachs. It is then found to be of a pale greenish colour, and very unpleasant to the taste. Yet it is preferable to dying of thirst, and is really hardly more disagreeable than the water contained in the leathern bags carried on the camel's backs, which is heated by the sun, besides tasting very strongly of the tar with which the seams are dressed.

This structure presents a singular analogy to the blood-reservoir of the whale, by which it is enabled to spend a considerable time beneath the surface of the water. A large supply of blood being purified and aerated in the lungs, is stored away in a mass of blood-vessels set apart for that purpose, whence a portion is introduced into the circulatory apparatus as it is from time to time required. But for this provision the whale could never spend more than two or three minutes together beneath the surface of the water, the air or aerated blood being quite as necessary to its existence as the water is to that of the camel.

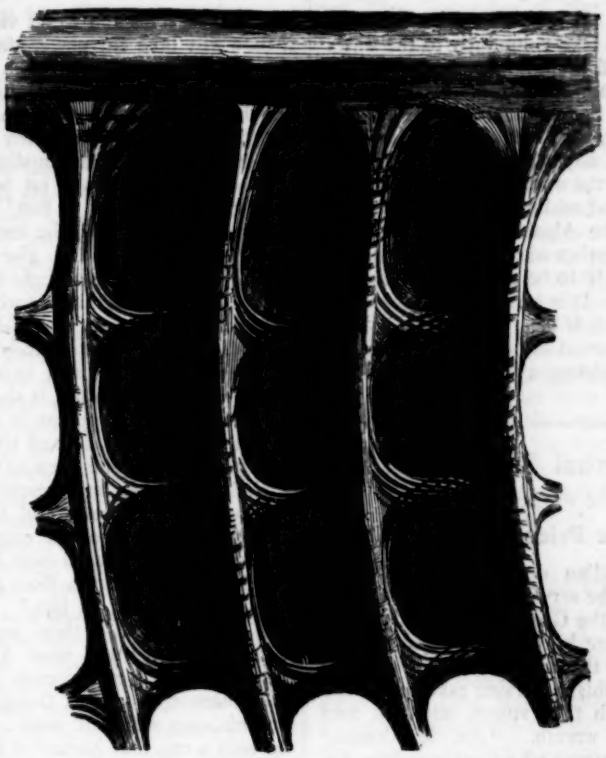
Of the two species of camel, the Arabian is by far the more valuable, being both stronger and more enduring of privation and fatigue than its Bactrian relative. The load of the Arabian camel is usually from five to six hundred pounds in weight, this being the average amount that the creature can carry with ease. It is by no means a swift creature, its pace seldom exceeding two miles and a half in the hour, and often not coming up to even that standard. There is a swifter breed, usually known as the Dromedary, which is chiefly kept for the saddle, and which can keep up a pace of eight or nine miles per hour for twenty hours at a stretch, being to the camel what the racer is to the cart-horse. The motion of the camel is most unpleasant to any one riding it, for it moves both legs of each side together, progressing at a long swinging trot, and jolting its unfortunate rider in the most unmerciful manner. Novices in camel-riding almost always suffer from sickness as badly as if they were in a Channel steamer on a rough day. With some of the faster dromedaries it is even necessary for the rider to swathe his body, from the hips to the arms, in bandages drawn as tightly as possible, before he commences his journey.

There is a mistaken idea that the camel is a very patient, gentle, and docile animal, and that he is very easily managed. In reality, the case is just the reverse, for a more quarrelsome, unruly, and revengeful animal hardly ever existed. No sooner is he unloaded than he begins to fight any of his fellows who may be in the neighbourhood; the loading and unloading are never performed without much trouble, and many savage grunts on the part of the camel, and when fairly loaded, his first endeavour is always to get free of his burden, or, failing that, to ruin every article included in it.

Then, at night, when it is time to unload, the cross-grained animal has to be compelled to kneel by main force, and his head tied to his fore legs in such a manner that he cannot rise until the proper time. An experienced traveller says that he has never yet seen a camel in anything but a bad temper, at any rate, to judge by appearances.

Besides its use as a beast of burden, the camel is of service to its masters in various other ways. Its milk, for example, is a standard article of food, and is mostly kept until quite sour, the Arabs considering it to be then a much greater dainty than when it is sweet and fresh. A very inferior kind of butter is churned from the cream by pouring it backwards and forwards in a goatskin for a certain time.

The flesh of the camel is considered a great dainty, but is very seldom eaten, owing to the value of the animal. Occasionally, however, a rich Arab will kill one of his camels, and invite all his friends to a feast, at which the flesh of the slaughtered animal appears as the crowning delicacy.



Water Cells in Camel's Stomach.

At certain times of the year the camel sheds its hair, which is collected, and being spun into thread, is used in making garments. Certain portions of it are also utilized for the 'camel's hair pencils' used by artists.

THE two-humped or Bactrian camel, which is found

Bactrian Camel.

throughout Central Asia and China, though now almost entirely used for the saddle, was at one time put to a very curious use. The East India Company formed a regiment of these animals, each being provided with a couple of swivel guns, placed between the humps, and managed by the rider. This company was known as the camel artillery, and was sometimes of considerable service.

The colour of the Bactrian camel is darker than that of its Arabian relative, varying from dark brown to a sooty black in hue.

THOUGH the true camels are exclusively confined to the Old World, a closely allied genus, comprising four species, is found in America. These animals are popularly known by the name of Llamas, and differ in many respects from the true camels.

In the first place, the toes of the foot, instead of being connected, as in the camel, are separated, and can be extended at will. This is on account of the rocky and mountainous nature of the localities which they inhabit, and in which the power of moving the toes is necessary in order to give them a firm foothold. All the Llamas are of very much less size than the camel, the Guanaco, the largest, not standing much more than three feet six inches at the shoulder. The hair is long and woolly, and the general aspect of the animals is remarkably like that of an overgrown sheep.

The four species are the Vicugna, the Guanaco, the Yamma, and the Alpaca. The first of these is found in the most mountainous parts of Northern Chili and Batavia, and is valuable on account of its skin, which causes it to be much sought after. In other ways it is entirely useless, as from its wild and untameable nature it cannot be employed as a beast of burden. In colour it is brown, approaching to grey beneath; the height is about two feet six inches at the shoulder.

The Guanaco, which is found in the more northern regions of Patagonia, is of a reddish-brown colour, the ears and hind legs being grey, and stands about three feet and a half at the shoulder. It lives in herds, varying from ten to forty or more in number, and like the sheep, under the guidance of a single leader, whose orders are always implicitly obeyed. Should this leader be killed or trapped, the flock seem perfectly bewildered, and wander vaguely from place to place, laying themselves open to easy capture by the hunters. The sense of curiosity is very strongly developed in the Guanaco, which, though naturally a wary and timid animal, can be brought within a short distance of a hunter if he lies on his back on the ground and

kicks his legs in the air. It is able to swim well, and has often been known to take voluntarily to the water and swim from one island to another.

The Yamma, or Llama, which was formerly used as a beast of burden by the Spaniards in America, is of a variegated brown colour, with long and slender legs. It is now little used in any way, the sheep having replaced it with regard to the wool supply, and its flesh being dark and coarse and seldom eaten.

The fourth species, the Alpaca, or Paco, as it is sometimes termed, is, together with the last-mentioned animal, sometimes thought to be only a domesticated variety of the Guanaco. It is a valuable creature on account of its wool, which is long and silky. A herd of Llamas was even imported into Australia, where it flourished fairly well, yielding a large supply of the valuable wool.

Short Historical Anecdotes.

BY REV. SIR GEORGE W. COX, BART., M.A.

(11) The Greek Prize of Victory.

WHEN some Arcadian deserters asked to be admitted into the service of the Persian king, Xerxes asked them what the Greeks were doing. The answer was that they were keeping the great feast of Olympia, and beholding the contests of wrestlers and horsemen. On hearing this, a Persian asked what the prize might be for which they strove, and was told that it was an olive wreath. 'Ah, Mardonius,' exclaimed one of the satraps who were standing by, 'what men are these against whom you have brought us here to fight, who strive not for money, but for glory?'

(12) The Dream of Xerxes.

The Greeks believed that a divine purpose sent Xerxes to invade their land for his own destruction. The wisest among his counsellors did all that they could to make him give up the enterprise; but their words only roused the wrath of the king, who laid himself down on his couch in trouble and vexation of spirit. As he pondered the matter, he thought that he ought to heed the warnings of his friends; but while he slept, he fancied that there stood over him a man, fair and tall, who said: 'Dost thou repent from leading an army against Hellas, when thou hast charged thy people to gather their hosts together? There is none that will forgive thee if thou doest so.' When the day dawned, Xerxes took no heed of the dream, but calling the Persians together, told them that his counsel was changed, and gladdened them with the tidings that he did not mean to go against the Greeks. But the same vision stood over him again the next night, and said: 'So now, son of Darius, thou hast changed thy purpose in the sight of the Persians, and put aside my words as though they had never been spoken. But be sure that if thou set not out forthwith, thou shalt be made low in a little while, even as in a little while thou hast been made great and mighty.' Then the king sprang from his couch in fear, and sending for his uncle Artabanus, told him how the vision bade him do that which he felt that he ought not to do. 'If it be a god,' said Xerxes, 'who sends the vision which has threatened me, and if the Persians must go against the Greeks, then the same vision will come to thee if thou wilt take my place, and will give thee the like charge. Therefore put thou on my dress, and sit first upon my throne, and afterwards sleep upon my couch.' At first Artabanus would not do this, because he thought himself unworthy; and he said too, that the dreams which come in sleep are for the most part visions of those things on which we have thought most during the day. 'But,' he added, 'if it be not as I suppose, then let the vision which has come to thee appear to me, and give me the same charge. Yet if it must come, it ought to come to me no more if I put on thy dress than if I wear my own, and no more if I rest on thy couch, than if I lay myself on my own. For whatever it be, it is surely not so silly as to think on seeing me, that it is looking on thee. If then, refusing to come to me, it shall return to thee many times, I should say that it was sent from heaven. But if thy purpose is fixed that I must sleep on thy couch, so let it come even to me. In the meanwhile I shall remain in my present mind.' So Artabanus put on the king's robe, and sat down on his throne, and thence went to his couch; and the dream of Xerxes came and stood over him, saying: 'Art thou he that movest Xerxes from going against Hellas, as though thou carest for him? Be sure that thou shalt not go unscathed, if thou seekest to turn aside that which must be; and what Xerxes must suffer if he obey not, has been already shown to him.' Then the dream appeared as though it were about to sear out his eyes with hot irons; and Artabanus, leaping up with a cry, told Xerxes of the vision and confessed his error. 'As a man who has seen many great and mighty things yield to what is mean, I thought that if thou couldst but remain at rest, thy lot would be held blessed by all mankind. But I see that thou art seized on by a dream from heaven, and my own mind is changed within me. Charge the Persians, therefore, to do as thou didst bid them at the first.' But yet another vision came to Xerxes, who dreamed that he was crowned with an olive wreath, and from the olive sprang forth branches overshadowing all the earth, and presently the wreath that was around his head withered away. From this the magicians judged that all the earth should be subdued before him; but the dream was like the vision interpreted to Pharaoh's chief baker by Joseph in the prison (Gen. xl.).

(13) Epameinondas at Mantineia.

At the moment when the Thebans were winning a decisive victory over the Spartans on the field of Mantineia, Epameinondas was struck by a spear, the head of which broke off and remained in his breast. At once the exultation of success was exchanged for intensity of grief, as his people crowded round the dying chief, whose life, the surgeon said, must end with the drawing of the spear-head from the wound. 'You die childless,' said one of these friends, his voice choked by his tears. 'Nay,' answered Epameinondas, 'I leave two daughters, the victory of Leuktra and the victory of Mantineia.' He then asked for two of the Theban generals, and was told that they were both slain. 'Then you must make your peace with the enemy,' he said, and ordering the lance-head to be drawn from his breast, died with the calmness of a brave man who has done his duty (B.C. 362).

(14) Pope Gregory the Great and the Emperor Maurice.

With Englishmen generally the name of Pope Gregory the First, or the Great, is associated with the story which accounts for the mission of St. Augustine to this country. All know the tale which tells how Gregory in the Roman slave-market saw some beautiful fair-haired children exposed for sale; how, on hearing that they came from Britain, and that they were pagans, he expressed his sorrow that the prince of darkness should possess such lovely forms; how, on hearing that they belonged to the nation of the Angles, he said, 'Truly they are angels;' and how, on hearing further that they came from the province of Deira, and from the kingdom of Ælla, he exclaimed, 'Truly they must be rescued, *de ira*, from the wrath of God, and Alleluia must be sung in the dominions of their king.' But all do not know the life and the character of Gregory in its strength and its beauty, or again in its darker aspects. In the latter we see in him the true forerunner of one scarcely less illustrious than himself, the seventh Gregory (Hildebrand). Gregory was a monk, and the rule was that none in the house of which he was the head should have any private property. One of the brethren on his death-bed confessed to a fellow-monk that he had three pieces of gold. The coins were found hidden away with some medicine. Instantly Gregory ordered that no one should be admitted to the sick man except his brother, and his brother was to say nothing more than that he died hated by the whole society. His body was cast out upon a dunghill, and the three pieces of gold were cast after it, while the monks cried aloud, 'Thy money perish with thee.'

As Pope, Gregory was unswerving in the assertion of his authority. Maurice, the Emperor of the East, had ratified his election with manifest reluctance, had treated him coldly, if not with some contempt, and had, at the least, done nothing to prevent the Patriarch of Constantinople from calling himself Universal Bishop. Maurice was dethroned by the usurper Phocas (a man whose countenance was as horrible as his character), and took refuge in a sanctuary (A.D. 499). Phocas interfered on behalf of the Greens against the Blues, factions which sometimes desolated the city, and filled its streets with blood; and the Blues cried out that Maurice was not dead, and might live to avenge them. Phocas at once ordered the fallen sovereign with his children to be brought before him. One after another Maurice's five sons were butchered before him, and at each stroke the father, looking on without a tear, exclaimed, 'Just art Thou, O Lord, and righteous are Thy judgments.' The head of Maurice fell last; and all, by the orders of the tyrant, were left unburied.

The tidings that Maurice had fallen, and that Phocas sat in his seat, drew from Gregory hearty thanksgivings for the mercy and benignity of the new ruler. He called on heaven and earth to rejoice at the happy revolution, and expressed his assurance that the peace and prosperity of the empire would be secured by the piety of Phocas. Such was the judgment of a man of whom it has been said that 'he was blinded by one absorbing object, the interest of the Church, which to him involved the interest of religion, of mankind, and of God.'—Milman, *History of Latin Christianity*, Book III. ch. 7.

(15) The Founder of the Benedictine Order.

Of all the founders of monastic orders, Benedict of Nursia was perhaps the most illustrious. Born in the latter part of the fifth century, he was sent for his education to Rome; but the child was resolved to flee from the snares of a wicked world, and escaping from his father's house, found his way to Subiaco, whither his nurse Cyrilla followed him. From this time his life exhibited a constant succession of marvels and miracles, which seemed to leave the ordinary course of human events altogether in the background. His nurse let fall and broke a stone sieve, used in this part of Italy for baking bread. The boy held the two pieces together, and his prayer reunited them. The people hung the sieve over their church door, but Benedict shrank from their veneration, and buried himself for three years in a cave, to the mouth of which Romanus, a monk of a neighbouring monastery, let down by a rope all the food that was ever supplied to him. This cave was on the summit of a precipitous rock, at the base of which the waters of the Anio surged and roared. On the other side rose another rock not less precipitous, where his sister Scholastica found a refuge.

In this hiding-place he remained for three years, known only to Romanus. At the end of this time a neighbouring priest had prepared an Easter-day dinner for himself, after the long fast of Lent; but his heart reproached him for feasting while the servant of God was starving. Who this servant might be, he knew not; but he took up his meal and was guided miraculously to the cave of the young hermit. Benedict had lost all count of days and seasons; nor would he touch the food until he had proof that it really was Easter-day. The secret was now betrayed. The countrymen who hurried to see him, and who saw him wrapped in skins, took him for a wild beast; but his eloquence melted their hearts, and led them to reform their lives. There now followed a time of hard trial for the recluse. The image of a maiden for whom he had felt some tenderness at Rome presented itself to his mind. He rolled himself on the sharp rocks and brambles, and banished it for ever. Some monks in the neighbourhood besought him to become their abbot: he told them that they would not like his rule, but they would take no refusal. His rigid austerity soon changed their disposition towards him. They tried to poison him; but the poisoned cup burst when he took it in his hands. Benedict calmly reproved them, prayed for their forgiveness, and returned to his cave, which now became the centre of a cluster of a dozen convents, each with twelve inmates. Here he was joined by the young nobleman Maurus, afterwards known as St. Maur, who was to be his successor. A youth, named Placidus, drawing water from the lake, fell in and was carried off from the shore. Benedict called to Maurus to help him, and Maurus, walking on the water, brought him to land. The incident was a miracle; but Maurus assigned it to the holiness of Benedict, and Benedict to the devotion of Maurus. The controversy was settled by Placidus, who said that, while he was drowning, the sheepskin cloak of Benedict had hovered over him.

Benedict had long since broken up his father's household. It was his special desire that his sister should follow his example, and she did so. But he

went to see her in her solitude once a year. When he came for the last time, as she lay on her death-bed, she prayed him to remain in the convent till the next day. It was impossible, he said: it was against his rule, and he had never spent a night out of his monastery. His sister prayed earnestly, and a fierce storm of wind, lightning, and rain came on. 'The Lord have mercy on you, my sister;' cried Benedict, 'what have you done?' 'You have refused my request,' she said, 'but God has not; go now, if you can.' A few days later he saw his sister's soul soaring to heaven in the form of a dove; and in a little while he himself reached the end of his earthly pilgrimage. In his distant convent at Auxerre, Maurus saw a pathway lit with lamps, stretching from Benedict's cell to heaven. It was the road by which the soul of Benedict was journeying to Paradise.

Such was the form into which the lives of monks and saints were thrown in the times known specially as the Ages of Faith.

(16) The Mission of Mahomet.

Mahomet, it is said, received his first revelation from heaven in one of the caves with which the mountain of Hira, in the neighbourhood of Mecca, is honeycombed. The messenger who announced to him his mission as the last of the prophets was the angel Gabriel, who appeared as a being whose feet rested on the earth, while his head touched the heaven. From this time all things in heaven and earth seemed to have a voice for him. As he walked along, the stones cried out 'Prophet of God,' and when he slept the same angelic form renewed the call. For a while Mahomet feared that these visions might be only the cheats of a disordered mind, but he was encouraged by his wife Khadijah, who, expressing her conviction that virtues such as his could not be thus severely tried by the Almighty, resolved to put these apparitions to a conclusive test. When next the vision was seen, Khadijah was sitting in the presence of her husband veiled. Thus shrouded, she put her arms round Mahomet and asked him whether he saw the angel. 'I do,' was the answer. Throwing aside her veil, she asked whether he saw him still, and he said, 'I do not.' 'Then,' cried Khadijah, 'peace be to thee; it is an angel, not a demon; for a demon would not have vanished when I put aside my veil.'

After many such appearances, the angel showed himself at last so distinctly, that Mahomet, still suspecting that he might be the victim of madness, hurried away to the edge of the mountain precipice, intending to throw himself over. Seizing him under his wing, the angel bade him read. 'I cannot read,' was the answer. 'Then repeat,' and he repeated after the angel the words which imparted the revelation and the mission of Islam. Returning to his house, Mahomet, prostrate from weakness and cold, laid himself down to rest. But he was not to be thus suffered to slumber. 'Rise,' said the angel. 'Why should I rise?' asked the prophet. 'Rise to preach,' was the answer: 'cleanse thy garments and fight with the evil.' When Mahomet told his wife that he had received this divine charge, her only reply was: 'I will be the first believer.' As they knelt together in prayer, and then at the angel's bidding performed their ablutions, the child Ali, who was to live to be the fourth Caliph, and whose sons were to die martyrs on the battle-field, asked them the reason for their doing this. Mahomet told him that it was because he had been commissioned to be the prophet of God, and that for all who believed this revelation salvation was assured. Thus Ali became the second of the faithful.

This was a beginning, but the work went on with extreme slowness. Two years passed before Abubekr and Othman, the first and the third Caliphs, made the confession of their faith; and even after this, Omar, who was to be the successor of Abubekr, undertook to murder the prophet for a hundred camels and a thousand ounces of silver. 'Before thou doest this,' said a convert, 'look to the people of thine own house.' Omar rushed to the abode of his sister, who had professed her belief in the prophet; he found there some sentences of the Koran, and reading them, was converted himself. But the malice of Mahomet's enemies was in no way abated. He moved from one bed-chamber to another, to avoid the dagger of the assassin. In one instance he is said to have escaped only because Ali took his place in the tent; and once while he slept in a cave, a spider, we are told, spread its web across the entrance, and a pigeon laid two eggs to show that no one had been there to disturb her.

Thus Mahometanism has a poetry answering to the poetry which we find in the legends of the founders of Christian monastic orders.

(17) Mahomet and the Persian King.

The mission of Mahomet was to enforce the authority of a book by the sword. The true believer was a warrior whose duty it was to carry on a life-long struggle with all who would not receive Islam. Death or the Koran should be the real and only fit alternative. The unbeliever had no right to life. The faithful might of his free grace suffer him to live, if he pledged himself to pay tribute, but the promise was a surrender of all that would make life bearable. The tributary lost all title to civil rights; he could not claim the protection of law; and the judges were instructed to make his days as miserable as they could. When once the tide was turned for Mahomet, it flowed in freely and with irresistible force. The prophet who fled in fear of his life from Mecca was soon able to send a peremptory summons to the king of Persia and the Roman emperor to acknowledge his mission and to adopt his faith. The Persian king was encamped on the banks of the Karasu when he received the letter of Mahomet. He tore it up, and as the wind scattered the fragments, he said, 'So shall his empire be torn in pieces.' The stream had hitherto fertilized the whole country; but now, in horror at his impiety, it shrank its waters within limits which made them utterly useless. From the Roman emperor the prophet's letter received very different treatment. The legend tells us that he took it with the utmost reverence, and placed it on his pillow, and that only the fear of losing his crown withheld him from professing himself a true believer.

For the faithful generally, Islam had potent inducements leading them to bestir themselves under the prophet's standard. Unimaginable torments awaited the apostate after death; nymphs of surpassing loveliness were ready to welcome those who died smiting the

infidel on the battlefield. 'Fight, fight; Paradise, Paradise!' was the war-cry of Khaled, the Sword of God. 'I see,' cried another in the thick of the fight, 'I see the black-eyed girls looking upon me, for the love of one of whom, if she could be seen on earth, all mankind would die. One of them has in her hand a kerchief of green silk, and a cap gleaming with precious stones, and she beckons to me, calling out, "Come quickly, I love thee!"'

—o—

'How I teach Arithmetic.'

(*Continued from page* 17.)

BY WILLIAM SPENCER,
Author of 'Spencer's Exercises in Arithmetic.'

IN working the Simple Rules, beyond giving the younger children an idea of concreteness in the most elementary stages, we have dealt chiefly, though not exclusively, with abstract numbers and mechanical operations. Few actual problems have been given, my view of the matter being, that in the Simple Rules it is preferable to secure expeditious mechanical working preparatory to the higher stages. In teaching persons who will never advance much, if at all, beyond the Simple Rules—as adults in a night school—more problems should be given; but for children, most of whom will be carried much further, problems may be deferred till Compound Rules are taken up, to which we now turn our attention. Though Compound Rules are sometimes *commenced* in the fourth class, it is in the third class that the real work of teaching them both as mechanical exercises and as problems is undertaken. With the *third* class, then, we now commence work.

The following exercises are specimens of a first lesson in Compound Addition:—

s.	*d.*
2	4
3	2
4	1
3	2
12	9

s.	*d.*
3	5
4	4
3	7
8	4
19	8

s.	*d.*
6	8
7	9
4	7
5	10
24	10

First call attention to the putting down of the first example, the first line of which is not 24 (twenty-four) as in Simple Rules, but two shillings and four pence. Show that the figures are separated by a *line*, or *dots*, or—as in printed matter—by *distance* only, and the name (or denomination) of each figure or group of figures is placed at the head of each column. Show also that the names are generally abbreviated—that £, *s.* *d.* are shortened forms for pounds, shillings, and pence. The origin of these letters (£ *s.* *d.*) had better at once be explained, otherwise the more intelligent and inquisitive children will puzzle over these cabalistic signs. As children are very apt to omit the headings in compound arithmetic generally, and thus consequently make egregious blunders, insist at the commencement on the headings being duly attended to.

In the first example above, as the pence do not amount to *ten*, we simply add up both columns as in Simple Addition. In the second example, as the pence amount to 20, explain that we do not put down 0 and carry 2, as in Simple Addition, but that we get all the shillings we can out of the pence, putting down the odd pence under the pence column, and carrying the shillings to the shillings column. Now add up the shillings—total, 19s. 8d. Proceed similarly with the third and other examples. Now advance to £ *s.* *d.*, first without farthings, then with them, explaining that farthings are represented as fractional parts of a penny—not as integers. Explain and impress well how 1, 2, and 3 farthings are written down as parts of a penny—¼, ½, ¾; then add up several columns of them (farthings) *alone*, to familiarize the children with them, as I generally at first find more blunders here than in the other columns. In adding up the ½d. call it *two* farthings, or the ½ is considered as inverted (²/₁), and then all the *upper* figures are simply added together. Compound Addition is easily taught, and also easily understood as to the *modus operandi*, but much practice is required to ensure even moderate accuracy. I find from experience more inadvertencies—'slips' we call them—in Compound Addition than in any other branch of arithmetic. It is highly necessary, however, that proficiency—including accuracy with rapidity—in addition should be steadily kept in view, as in after life, with the great majority of people, it is far oftener called into requisition than any other arithmetical process whatever. The importance of correct adding has long been acknowledged by the Government in its examinations for the public service, by giving special exercises in 'long addition.'

As a compound addition sum requires more time to put down on the board than almost any other kind, it often happens that children really see very few done on the board,—hence inaccurate results in their own working. *One* sum put down can easily be slightly varied by altering a few figures, or by adding to or diminishing the number of lines, so as to make any number of exercises out of it. For slate (or paper) practice I use my *Mechanical Exercises in Money*, on each card of which the first two sums are Compound Addition.

After working at Compound Addition a week or two, with an occasional exercise in Simple Rules—especially in long division—Compound Subtraction is commenced, which is easily taught and soon understood, as illustrated in working the two following examples:—

£	*s.*	*d.*
608	14	8¾
190	18	9½
417	15	11¼

£	*s.*	*d.*
830	0	7¼
485	13	8½
344	6	10¾

In working these exercises, as in all operations now, take special pains to impress the idea of concreteness—that we are really seeing what would be left were we to take the money represented by the lower line from that represented by the upper line. In the first example let them suppose that a person owed £608, 14s. 8¾d., and that he paid £190, 18s. 9½d., and that we wish to ascertain how much he still owes. Or vary the mode of presenting the question, by supposing that a bag contains the former sum of money, and that the latter sum is taken out,—find how much is left in the bag. Here I explain the true theory of 'borrowing' or 'adding,' as it can be more easily done than it could have been in *Simple* Subtraction; and the children being more advanced in general intelligence, they can more easily

understand the principle of operation. As the ½d. can be taken from the ¾d. without borrowing, we pass on to the pence. As we cannot take 9d. from 8d., we take a shilling from the 14s. and change it into pence (12), which with the 8d. makes 20d., then 9d. from the 20d. leaves 11d. Again, 18s. from 13s. (not from 14s.) we cannot, then we take a pound (=20s.) from the £8,—then 20+13=33s., from this 18s. is taken, leaving 15s. Now show that as there is no higher denomination than pounds, the remainder of the process is only Simple Subtraction,—merely the taking of 190 from 607. I find, however, that although the principle of subtracting may be well understood by a child, in practice he mostly increases the subtrahend by one, rather than lessening the minuend. I account for this by his having acquired the habit in working *Simple* Subtraction, and it is, I think, on the whole to be preferred; because, when the upper figure in the pence or shillings is a cipher, as in the second example, he would be more likely to make a mistake in lessening the minuend than in increasing the subtrahend. A few days' working on slates, with an occasional example done on the board, secures both quickness and more than ordinary accuracy in Compound Subtraction, the most fertile cause of error being in carrying when it is not required rather than in neglecting to carry. Compound Addition and Subtraction are now worked together from cards—*Mechanical Exercises in Money*—the first two sums on each card being in Addition and the second two in Subtraction.

The next step forward is the teaching of Reduction. Here the scholar's mental powers are more severely taxed than in any previous stage. The working of Compound Addition and Subtraction has given a boy a slight glimmer of different denominations in relational value, but he is now called upon to grapple with the subject directly and distinctively; hence the *educational* value of Reduction as a mental discipline apart from its utility. I generally contrive to give the first lessons to a class in Reduction myself,—the first exercises in it, as in every other operation, being mental only. The older manuals on arithmetic divide Reduction into *descending* and *ascending*, the former reducing to smaller denominations, and the latter—though somewhat a misnomer—to higher. The descending process being at once both easier and more in accordance with the name—Reduction—we commence with it. Procedure:—How many pence in 3s., in 8s., in 6s. 9d., in 12s. 5d., in 14s. 7d., etc.? Yes, 14s. 7d. is 175d. Now let us do it in figures, putting down 14s. 7d. Every shilling is 12d., then 14s. are 14 times 12d. = 168d.; or 12 times 14=168, +7=175d. Or taking another view, every shilling is 12 times as many pence, hence 18s. 9d. is 12 times 18, +9=225d. Hence we see that in order to bring shillings to pence, we multiply them by as many pence as make a shilling (12), and then add in, if any, the pence given along with the shillings. Further examples:—Bring 29s. 3d. to pence; 73s. 9d. to pence. Here (73×12)+9=885d.; now bring these 885d. to farthings,—explain clearly that there will be 4 times as many farthings=3540. Now bring these 3540 farthings back to pence, then to shillings, noticing that the result—73s. 9d.—is what we began with. Now bring (say) £3, 17s. 11d. to farthings, explaining clearly every step in the process, and writing at the end of each successive line the denomination to which it is brought. The following might be given, and mostly worked on the board, as additional examples in a first lesson:—Bring £27, 18s. 4½d. to farthings; £54, 19s. 10d. to halfpennies; £168, 14s. 8d. to twopences; £9837, 14s. 6d. to threepences, etc. In the last two examples, explain well and caution as to the 8d. and 6d. in reducing—that the 8d. is only *four* twopences, and the 6d. *two* threepences. A child now begins to perceive that figures represent numbers of real things, and not merely mystic hieroglyphics invented to keep boys employed at school, a character which they somewhat assumed in working Simple Rules. A second lesson in Reduction would be somewhat as follows:—Bring 379d. to shillings; 877d. to shillings; 2179d. to £ *s.* *d.*; 8259 farthings to £ *s.* *d.*; 90,183 halfpennies to £ *s.* *d.*; 847 threepences to £ *s.* *d.*; 9181 fourpences to £ *s.* *d.*; 236 crowns to farthings; 835½ crowns to halfpennies; 9183¾ crowns to farthings, etc. We will work out this last exercise. First elicit that ¾ crown = 3s. 9d., then 9183¾ cr. = 9183cr. 3s. 9d. What shall we find first? 'Multiply by 5,' several are ready to say. I here remark to the children that I did not ask *how* we should do it, but *what* should be done first, *i.e.* what operation we are about to perform. After eliciting that we are first to bring the crowns to shillings, then get out of them *how* this is to be done. In working any problem that requires thought and involving varied operations, I am careful first to ascertain the steps *to be taken*, and then the *modus operandi* of taking these steps. We now bring the crowns to shillings by multiplying them by 5. A thoughtless inattentive boy would very likely multiply the whole line by 5. Show the absurdity of this—that we are reducing the crowns only (at present) to shillings. Show that the 3 shillings must be added in, and then proceed very slowly to reduce the shillings to pence, and then the pence to farthings. I generally find that a few days' practice in Reduction (money) suffices to gain tolerable proficiency, consequently *formal* exercises in Reduction are soon abandoned for more general work in the Compound Rules of money, in working which the answer is often required to be given in some specific denomination—as pence, farthings, twopences, etc. The next step in advance is to Compound Multiplication, which, as shown in working Simple Multiplication, is only a kind of Addition. Work out an easy example both ways, by putting down a sum of money (say) 6 times and adding it up, then by multiplying it by 6. In working multiplication by composite numbers, care must be taken that each line of the result is clearly understood, as in the following example:—Multiply £638, 14s. 9¾d. by 62.

£	s.	d.			
638	14	9¾			
			10×6+2=62		
6387	8	1½	price of 10 houses.		
		6			
38324	8	9	,,	60	,,
1277	9	7½	,,	2	,,
£39601	18	4½	price of 62 houses.		

Here we have to multiply £638, 14s. 9¾d. by 62, that is, we want to know how much 62 times as much money would be. We will suppose this sum to be

the price of a house, then we wish to ascertain the value of 62 similar houses. As before observed, let the children see clearly *what* we are aiming at, before we commence working. Point out the difficulty of multiplying by 62 at once; then give a notion of composite numbers by showing (say) that 30 houses would cost as much as 3 times 10 houses, 60 houses as much as 6 times 10 houses, etc. As 62 is not found as the product of any two simple numbers in the table, we take a number conveniently near to 62, as 10 times 6, and 2 more. Explain clearly the formula of expressing this as above, see that each of these signs is clearly comprehended and remembered, and insist that in working, such formula is clearly and fully put down; as children in working arithmetic at any stage are apt to put it down in a fragmentary and indistinct manner, thus making many mistakes in their work in consequence.

Having multiplied by 10, show that the result is ten times the upper line, or the price of 10 houses, and express this as above. Having multiplied this result by 6, the majority of the class will perceive this result is the price of 60 houses, but some imprecocious ones will say that it is the price of 6 houses. Now proceed carefully to get the price of the 2 remaining houses, and complete the work; show clearly what result we have obtained—that 62 houses, each worth £638, 14s. 9¾d., would in all be worth £39,601, 18s. 4½d. This answer might now be brought to farthings, halfpennies, or three-halfpences, as an exercise in Reduction. As some Inspectors give multiplication of money by thousands—(say) 6389, it is well to teach children to form composite numbers to this extent by multiples of 10 as far as the highest power of 10 given, and then to multiply each line by its specific corresponding figure. The wisdom and equity of such exercises appear doubtful, as they belong rather to 'Practice' than to Multiplication. I now give about a fortnight's working to the Compound Rules so far taught, the exercises being supplied as before from dictation, writing them on the board, or cards—doing all on the card except those in Compound Division.

The next move forward is to Compound Division, one specimen of which we will work carefully out:—

	£	s.	d.	
9)	637	14	9½	
	£70	17	2¼	—4 nuts each,—and 4 nuts over.

Explain clearly that we are here going to divide £637, 14s. 9½d. into 9 equal parts, or equally among 9 persons; and that we wish to know what each part will be, or how much each person will get. Having divided the pounds, we have £7 over, which we change for 140s.,—the children's attention being aroused by imagining that we send a boy with 7 sovereigns to exchange for 140s. Then 140+14=154s., which enables us to give 17s. to each of the 9 persons, and leave 1s. over. Then proceed similarly with the pence and farthings, leaving 5 farthings over. Still further to excite interest, I often suppose the surplus farthings to be spent in fruit, nuts, etc. Here we suppose the 5 farthings to be spent in nuts at 8 for a farthing, thus obtaining 40 nuts, which gives 4 nuts for each, and 4 nuts left over. The 4 surplus nuts, I might facetiously remark, I will pocket for doing the sum, as there is not one each for the 9 persons.

After a few days' working some scores similar to the above, Long Division of Money is taken, an example of which we need not work out at length, having gone at length into the working of an example in Simple Long Division. Here explain as before, that Long Division *records* the work more at length, and places the answer in a different relative position to the amount divided, but that the principle of working is precisely the same. The whole of the Compound Rules of Money having now been taught, copious examples are now given in all the modes previously referred to, especially daily working of *Mechanical Exercises in Money*, of which all the varieties of examples the children are supposed to be able to work.

When *mechanical* proficiency in working money is fairly secured, *problems* requiring thought and contrivance are taken pretty freely. I will go through the process of working out a card (No. 14) in *Problems in Money* as specimens:—(1) If rabbits are 1s. 3d. each, how many could be bought for £415? The question having been written plainly and fully on the board, I proceed as follows:—What do we want to know? How many rabbits for £415? One costs 1s. 3d. Then we can buy as many rabbits as there are 1s. 3d. in £415. How shall we find that out? Divide £415 by 1s. 3d. *How* can we divide it? Get them both to the same thing. What shall we get them to? Some will say farthings, others pence, and a few of the most thoughtful will say to threepences. Having worked the problem (say) by both pence and threepences with the same result (6640 rabits), lead them step by step—2 will cost 2s. 6d., 4 will cost 5s., etc.—to see that 16 rabbits will cost £1, and that the shortest method would be—16×415 or 415×16=6640 rabbits as before.

(2) Divide five and a quarter guineas among 21 boys. How much will each get? First elicit that 5¼ gs. = £5, 10s. 3d., by questioning out that 5 gs. = £5, 5s. and the ¼ g. = 5s. 3d.; then divide by 21 by *Short* Division. Work this question also by mental arithmetic. Elicit that if there was *one* guinea (21s.) each boy would get 1s., and as there are 5¼ gs., each will get 5¼s., or 5s. 3d.

(3) A shopkeeper burnt 63,500 cubic feet of gas in a year. How much would it come to at 3s. 9d. a *thousand* feet? Impress well that 3s. 9d. is the price of a *thousand* cubic feet—not of *one* foot. Give some notion of a cubic foot and the mode of measuring gas. A little questioning will bring out 63½ thousand feet, hence that we require 63½ times 3s. 9d.,—result, £11, 18s. 1½d.

(4) Ten pounds being divided among 50 girls and 30 boys, each girl received 2s. 3d.; find how much each boy would get. This question requires more thought than any of the three previous ones. Read it over aloud slowly two or three times. Each girl gets 2s. 3d.,—then we can find what *all* the girls get,—£5, 12s. 6d. There is £10 in all, and the girls receive £5, 12s. 6d. Who get the remainder? The boys. How many boys are there? Find the remainder—£4, 7s. 6d., which divided among 30 boys gives 2s. 11d. each.

(5) If a turkey be worth a goose and a hare, and a hare be worth 2s. 9d., and a turkey worth 10s. 6d., find the value of fifty geese. Read the question over slowly and carefully as before. Which is the most valuable? A turkey. What is it worth? 10s. 6d.

Elicit that it is worth also both a goose and a hare. Now show that we know the price of the hare,—hence 10s. 6d. – 2s. 9d. = 7s. 9d., the price of a goose; then 7s. 9d. × 50 = £19, 7s. 6d. Ans.

Compound Rules of Money, including Reduction, being the limit of arithmetic in the third class, exercises and problems in them, together with frequent exercises in high numbers in the Simple Rules, form the staple work of the class for the greater part of the year—especially for the two or three months immediately preceding the inspection, as the majority of the class will be examined in the Third Standard. In this class the examples are, as in the lower classes, supplied by original questions dictated or set on the board, or by cards. By original questions I mean those made for the occasion, not taken from any book or card; or if thus taken, then more or less altered so that the result is different. The answers to questions from books and cards should not become too familiar, otherwise the result may sometimes prove unsatisfactory, both industrially and morally. The following five sums are a fair specimen of an *early*, and therefore easy, lesson written on the board at this stage:—

(1) Take £607, 14s. 10¼d. from £4000, and bring the remainder to farthings.

(2) What would 45 horses cost at £25, 18s. 9½d. each?

(3) Bring 6189¾ guineas to threepences.

(4) If caps are 2s. 4½d. each, how many can be bought for £26, 15s. 8½d.? State clearly what money is left.

(5) Divide £8179, 16s. 8¾d. by 307.

The cards—which increase in frequency of use the higher we go in the school, as well as in proportion to greater proficiency being acquired in each class—now used are 'Mechanical Exercises in Money,' 'Problems in Money,' and occasionally a card in 'Simple Multiplication and Division.' Young teachers are in danger of thinking that mechanical work will produce the best results at an examination; but my own experience, beyond the Second Standard, is decidedly contrary to this opinion. Hence, when fair mechanical skill is acquired, a large proportion of the time devoted to arithmetic should be given to problems, as they cultivate a child's reasoning powers, and thus strengthen his mental grasp for other subjects as well as for arithmetic. Third Standard test cards are also occasionally used for their specific purpose—*tests*—not for general working.

The mental arithmetic for the third class may best be shown by a list of specimen questions:—How much is 700d., 824d., 669d., 939d.? What would 7 lb. of butter cost at 1s. 3d. a lb., 9 lb. at 1s. 4½d., 13 lb. at 1s. 2½d., 18 lb. at 1s. 1½d., 25 lb. at 1s. 2½d., etc.? What would 2½ yards cost at 5s. 6d. a yard, 3½ at 6s. 6d., 8¼ at 2s. 6d., etc.? 40 slates at 1½d. each, 60 at 2½d., 80 at 2¼d., 100 at 3¼d., 200 at 4½d., 150 at 3½d., 240 at 5¼d., etc.?

We now pass to the teaching of the *second* class, of which a few young intelligent children may not yet have passed the Third Standard, and a few imprecocious ones, lacerated and maimed, may have just scraped through the Fourth Standard; but the majority of the class are preparing for the Fourth Standard. The first advance in teaching in this class is to Compound Rules of Weights and Measures, the pre-requisite to which is committing the tables to memory, which is often partially done in the third class. In going through the tables, care is taken that the scholars, by explanation, reference, and comparison, form some notion of what the terms used really represent. A lb., a cwt., a ton, a furlong, an acre, a gallon, etc., may be compared with some sensible objects at hand, or with something with which they are familiar.

The tables being well known and understood, the teaching of Compound Rules in them is so similar to the teaching of Compound Rules of Money, that little difficulty is met with so far as teaching is concerned—no new principle or even process being required, although, of course, much practice is required to secure expertness and accuracy. Here, also, in Weights and Measures, we have greater scope for the working of Reduction in all its conceivable phases, which alternates well with copious mechanical exercises in the four Compound Rules. When the scholars are *au fait* in the above work, 'Problems in Weights and Measures' are plentifully worked, alternating pretty often with 'Problems in Money.' I find when a boy can work these two packets of cards even fairly, assuming that he can also work the corresponding mechanical exercises, he is fairly safe for the Fourth Standard examination, as they extend somewhat beyond the requirements of the Code.

The next move forward is to take 'Simple Practice,' which requires skilful teaching, in order that each step may be duly comprehended. A few exercises may be given in illustration:—(*a*) 8175 oranges at ½d. each. Now if they were 1d. each, the amount would be 8175d.; but show they are only *half* a penny each, and work accordingly. (*b*) 7835 oranges at ¾d. each. Here, as no number of times ¾d. exactly makes a penny, explain that we see what they would be at ¼d. each, and that the other farthing in value would be half the price at the ¼d. (*c*) 9175 books at 8¾d. each.

	9175 at 8¾d.		
6d. is ½			
2d. is ⅓	4587	6	= price at 6d. each.
½d. is ¼	1529	2	= „ 2d. „
¼d. is ½	382	3½	= „ ½d. „
	191	1¾	= „ ¼d. „
20)	6690	1¼	= price at 8¾d. each in *s. d.*

£334 10 1¼. Answer.

Were the articles in the above example a shilling each, they would be worth 9175s., consequently at 6d. each they are worth *half* this number of shillings. We have 2¾d. in the price left, and as no number of times 2¾d. exactly make 6d. or 1s., we take as much of it as we can—2d., which is one-third of 6d.; consequently the articles at 2d. each cost one-third of the price at 6d. each as above. We might now take the remaining ¾d. as ⅛ of 6d., but for beginners it is better to take parts of the last preceding price until the process is clearly understood and some expertness in manipulation is attained. We therefore now take ½d. as ¼ of the 2d., and then the remaining ¼d. as ½ the ½d., and complete the working as above. Work others as a first lesson—(say) 7189 at 9½d., 61831 at 4¾d., 9427 at 5¼d., 4109 at 10¾d., etc.

After a few days' working at such exercises as the

above—pence only—we proceed to take shillings and pence, worked at first by multiplying by the number of shillings and taking parts for the pence as before—which, however, involves no new principle. A few early examples might be—8109 caps at 1s. 4½d. each, 7089 at 2s. 8½d.; 6109 tons of coal at 9s. 2¾d. a ton, 84,091 at 13s. 10¼d., 9473½ at 16s. 5½d., etc. In the last exercise show that the easiest method of working the fraction (½) is to leave it till the last, simply adding ½ of 16s. 5½d. to the various amounts previously obtained. After a few lessons and a few days' practice as above, parts of a £, instead of parts of a shilling, are taken, several exercises being worked both ways showing the results to be identical. We are now prepared to work prices consisting of £, *s.* *d.*, as all that is required additional is to first multiply the number of articles by the number of £'s in the price, and then take parts of a £ for the shillings and pence as before. Examples:—7183 coats at £1, 16s. 8½d. each, 91835 at £3, 11s. 4¾d.; 9283 oxen at £12, 12s. 1½d. each, 7107 at £28, 14s. 7½d., etc. As the chief difficulty felt by a scholar here is in adjusting the pence, or shillings and pence, to their correct fractional parts of a shilling or pound respectively,—or some previous fractional part,—such exercises are often done on the board without working the sum fully out, *i.e.*, only arranging the fractional or aliquot parts. After some weeks' drilling in 'Simple Practice,' liberally interspersed with working *problems* in the Compound Rules, especially Weights and Measures, 'Bills of Parcels' are taken up next in preference to proceeding to 'Compound Practice.'

'Bills of Parcels' being a somewhat vague expression, I explain that the term implies statements or accounts of goods sold or bought made out *pro forma*, with a heading showing the seller and buyer, with a date or dates, and that each item of which a bill consists is to be correctly calculated, so that the total amount of the bill may be clearly seen. As 'Bills of Parcels' embody no principle or process of reckoning not previously gone over, the teaching of them is not very formidable, all that is required on the part of the worker of them being—a knowledge of the Compound Rules, Reduction, and a fair modicum of general intelligence duly applied. Readiness in mental arithmetic is here of very great service, as many of the items given may often be solved purely mentally, without any resort to pen or pencil whatever. The three desiderata in working 'Bills of Parcels' are—correctness, neatness, celerity; and these three qualities I respectively appreciate in the relative order given. Neatness and completeness should be specially cultivated here, as the quicker a boy is at figures, the more danger there is of his considering neatness as superfluous, and regarding an explicit statement of each item as a redundancy. Show clearly the nature of *settling* a bill, and why the payee's signature is required. Explain the connection between the heading of the bill and its settlement. It is amusing to notice the absurdities many children perpetrate in heading and in settling a bill, the former arising from their non-acquaintance with the proprieties and conventionalities of society, and the latter simply because the *rationale* is not comprehended. Show when a receipt stamp is required, also why not on small amounts under £2; and, if the teacher chooses, he might make a few remarks on taxation, and the necessity of it. 'Bills of Parcels,' more than any other branch of arithmetic, should be done on paper, the work which cannot be done mentally being worked on a wide margin of the same paper, or on a separate piece of scrap. As this article is occupying considerably more space than I originally intended, I shall not work out or give any examples as specimens, but at once hasten on to 'Compound Practice,' of which the following exercise will serve for reference:—Find the cost of 6 ton 16 cwt. 3 qr. 15 lb. of hay at £4, 17s. 6d. a ton.

		£	s.	d.		ton	cwt.	qr.	lb.
10 cwt. is ½		4	17	6					
				6					
		29	5	0	price of	6	0	0	0
5 „ is ¼		2	8	9	„	0	10	0	0
1 „ is ⅕		1	4	4½	or 112/224 „	0	5	0	0
2 qr. is ½		0	4	10½	„ 112/224 „	0	1	0	0
1 „ is ½		0	2	5¼	„ 56/224 „	0	0	2	0
14 lb. is ½		0	1	2⅝	„ 28/224 „	0	0	1	0
1 „ is 1/14		0	0	7 5/16	„ 14/224 „	0	0	0	14
		0	0	0 117/224	„ 117/224 „	0	0	0	1
Answer,		£33	7	3 159/224	„ 607/224 „	6	16	3	15

Here show that the price of some article—a ton in this case—is made the basis or unit of operation; not the number of articles, as in Simple Practice. The price of the 6 ton having been obtained, we proceed as above to take fractional parts of a ton for the cwts. qrs. and lbs. till the whole is taken, the process of which appears to call for no special remarks, except the mode of obtaining the exact fractions of a penny. All goes smoothly till we come to half of 2s. 5¼d., when we find we have 1s. 2d. and half of 1¼d. We might reason out the result by showing that ½ of 1d. is ½d., and ½ of ¼d. is ⅛d.; then as ½d. can be shown to be 4/8d., we have in all 5/8d. Here we might leave working the sum a few minutes, and work out in the same manner several similar operations, as ½ of 2½ = 5/8, ½ of 2¼ = 9/12 = 3/4, ¼ of 2½ = 5/8, etc. Now show that these little exercises can be shortly worked by putting the number to be divided over the divisor, and bringing each to the fractional parts represented by the denominator of the part of a penny. Thus $\frac{2\frac{1}{2}}{3}=\frac{5}{6}$, $\frac{2\frac{1}{2}}{4}=\frac{5}{8}$, $\frac{4\frac{1}{4}}{5}=\frac{17}{20}$, $\frac{8\frac{1}{6}}{12}=\frac{49}{72}$, $\frac{7\frac{5}{14}}{14}=\frac{117}{224}$, etc.

Going back to our exercise above, we proceed to attempt to add up the six fractions, which again introduces a new element, and requires care and close attention. Here we are really teaching addition of simple fractions, which might be done before entering on Compound Practice at all—or now taught in conjunction with it, as we have found the necessity of adding fractions to have arisen. Here explain the necessity of bringing each of the fractions of a penny to 224ths. Begin with the ½, showing clearly that it will be 112/224, the ¼ will be 56/224, etc. Having got the sum of the fraction—607/224, reason out that they equal 2 159/224, and then complete the exercise.

Compound Practice sums are capital exercises for mechanical work, requiring also thought in taking the correct fractional parts, and care in adding up the fractional parts of a penny. When fractions, for which we are nearly ready, have been definitely taught, Compound Practice will be more easily comprehended and worked.

(To be continued.)

An Account of the Phonic System of teaching Reading.

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IT will not be disputed that in dealing with very young children it is advisable to adopt such methods of instruction as will tend to ease and interest the learner, and secure the best results in the smallest space of time, and nowhere are these more desirable than in the teaching of reading. The advocates of the Phonic method make claim to all these points in favour of its adoption. When perfectly carried out, it has been proved that the following standard of reading may be easily attained by a child of six years of age, of average intelligence, who has been under regular instruction the previous three years—the pronunciation good, the articulation clear and distinct, and the fluency such that narratives like those of the Gospels, or of the difficulty of *Robinson Crusoe* or the *Vicar of Wakefield*, may be read with few mistakes, and in not much longer time than the teacher herself would require.

The late Mr. W. L. Robinson of Wakefield was the inventor of this system. He began to turn his attention to the subject of infant teaching about twenty-five years ago, and for two or three years he made a great many experiments in instructing very young children himself in reading; his object being to contrive a Phonic system that should almost unite the accuracy and rapidity of the Phonetic method, and yet to use ordinary type. His first fear was that the extended alphabet of sixty-five characters, which he was obliged to compile to meet the requirements of the language, would be an insurmountable obstacle to his young pupils; but he was most agreeably surprised to find that it was easily mastered, though of course in not quite so short a time as a child would take to learn the names of the ordinary twenty-six letters; whilst the gain in reading afterwards made up ten times over for the increased difficulty of acquiring so extended an alphabet. In 1858 the managers of the Wakefield Lancasterian School, including Mr. Samuel Wilderspin, the founder of the Infant School system, having seen the remarkable results produced by the method, determined to introduce it into their infant department; and Mr. Robinson was induced to undertake to instruct the teachers, and to superintend its working in school till thoroughly established. It has now been in use over twenty-two years, and during the time several of H.M. Inspectors have borne excellent testimony to the merits of the system.

Mr. Brodie, after one of his visits, reported that 'the results of the Phonic method of teaching to read surprised me.' On another occasion he says: 'The infants are taught reading on a good method, and I can fairly say that they read exceedingly well for their age.'

Mr. Milman, after his examination of the school, reported: 'Great pains are bestowed on the reading throughout the school, and the peculiar system by which it is taught to the younger children is certainly, judging by the result, successful, inasmuch as they all, both the older and the younger, are able to read with unusual clearness, facility, and intelligence.' The following year he said: 'The first class reads remarkably well in books adapted for much older children.'

Mr. Fitch reported the first time that 'the teacher in reading achieves very remarkable results;' and the next year: 'The quality of the instruction is unusually good in all the three elementary subjects, but the special merit of the school is the reading. Every child presented in the First Standard reads with ease the lessons appropriate to the Second Standard.'

Mr. Baily reported that 'the method of teaching reading here appears to make reading much easier to young children, and deserves attention.'

Mr. Pickard, that 'the reading is unusually good.'

Mr. Legard, that 'the excellence of the reading here deserves especial mention.' And again, that 'the infants presented in the First Standard did their reading excellently.'

It may be mentioned incidentally here, that the system has been in use for three or four years in some of the schools under the Leeds School Board, and that the Sheffield and the Darlington Boards have recently introduced it into some of their schools. In Sheffield the Inspector reported after his visit to the school where the system was on its trial, that 'the methods employed are very intelligent, and have been carried out with vigour and success. The progress made in reading by such young children is remarkable.' And at Darlington, scarcely a year after its introduction, the Inspector there reported: 'The reading is in this little school taught with very great success, and in a very intelligent manner. The system seems worthy of a more extensive trial.'

Like most new proposals, the system at first had to encounter much adverse criticism. Among other objections raised against it, it was affirmed that it must lead to bad spelling. But the result has been, that while exceptionally good reading has been obtained, the spelling in the long run has gained rather than suffered by the system. This is doubtless due to the fact that the children having been taught to read so soon, a very considerable amount of time can be devoted to the transcription and dictation of many of their reading lessons, which after all has been found to be the best method of ensuring good spelling. It is pleasing to find that Mr. Blakiston, H.M. Inspector of Schools, and an experienced educationalist, in his admirable little work *The Teacher*, advocates precisely this plan of teaching spelling, and, moreover, seems to recommend a Phonic system of teaching to read. After the first year's trial, a public examination of the infants was held, when Mr. Robinson took the opportunity of explaining the system to a large gathering of the parents, many of whom were rather prejudiced against so novel a plan, and of which many of them were entirely ignorant. Children, indeed, had been withdrawn from school during the year, as they did not know their letters, and could do nothing, as one mother put it, but 'puff and blow,' alluding of course to the giving of the powers of the letters instead of their names. However, the reading of the children on this occasion thoroughly surprised those present, particularly that of a child of four and a half years, who read with ease Smith's *Baby's Debut*, and a short paragraph at sight from that day's *Times*.

The order of the ordinary alphabet is arbitrary and unphilosophical, as characters for like sounds, instead of being classed together, are separated by long intervals, as **b** from **p**, **d** from **t**, **f** from **v**, etc. The following copy of the Phonic Alphabet will show, however, that much thought and trouble must have been given to its systematic arrangement:—

p	s	th	i	ai	î
b	ċ	ṯh	y	ay	ȳ
t	ṣ	l	e	ā-*e*	ī-*e*
d	z	r	a	ä	oi
c	sh	ẇ	o	au	oy
k	ċh	ÿ	ȯ	aw	oū
q	ŝ	x	ọọ	â	ow
g	f	ẋ	ü	oa	eu
m	ph	ch	u	ō-*e*	ew
n	v	ġ	ē-*e*	oo	ū-*e*
n͡g	h	j	ea	û	

All the sounds in the language consist either of *whisper*, the sound of air forced through small apertures, as the **f** in **fife**, of *vocalised breath* formed by the vibration of the vocal chords while producing the whisper, or of *pure vocal tone*, as in the case of the vowels. Take from the sound **v**, as in **voice**, its *vocal element*, and the remainder is the *whisper* **f**. Add to the *whisper* **s** or **t** *vocal tone*, and the result is **z** or **d**. This is the principle upon which the whole system of consonant sounds is based.

It will be seen that the Alphabet, or the Table of the Powers of the Letters, is divided into two great divisions — *consonants* and *vowels*, the first three columns to the left being *consonant*, and the last three columns to the right, *vowel* sounds. The consonants are placed in the order of their relationship of *whispered* and *vocal* sounds; thus, taking the first column, the *whispered sound* **p**, as pronounced in the word **peep**, being followed by its *vocal power* **b**, as in **bay**; the *whispered* **t**, as in **town**, by the *vocal consonant* **d**, as in **day**; and the *whispered* **c**, **k**, **q**, as in **cat**, **king**, **quay**, by its corresponding *vocal sound* **g**, as in **gas**. These are termed explosive whispered and *explosive* vocal consonants respectively, as in producing them the breath is compressed and its egress prevented by the tongue or lips, so that on the impediment being removed a whispered or *non-continuous* noise is produced, such as is heard when a cork is drawn from a bottle. Following these are the *nasal consonant sounds* **m**, **n**, **ng**, as in **mimic**, **nun**, and **sing**, so called as the breath which produces them is entirely passed through the nose. Unlike those which precede them, they have no corresponding whispered sounds, the reason of which is that the whispers are either inaudible or too weak to be of any value in speech.

In the second column are arranged what are called the *continuous consonant sounds*, because it is possible to prolong them without any alteration of their character. These also follow each other in the order of their *whispered* and *vocal* representatives, as the *whisper* **s**, **c**, as pronounced in **sit** and **city**, with its *vocal* **s**, **z**, in **bids** and **buzz**; the *whisper* **sh**, **ch**, which cannot be represented except by these digraphs, as in the words **shall** and **bunch**, followed by the *vocal* **zh**, represented most frequently by **s**, as in **hosier**, and sometimes by **z**, as in the **azure**. Next follows the *whispered sound* represented by **f** and the digraph **ph**, as in **far** and **physic**, with its *vocal power* **v**, as in **vivid**. Then follows the *aspirate*, a whispered sound having no corresponding vocal element.

The third column is headed by the *whispered consonant sound* **th**, as in **thin**, followed by the *vocal* **th**, as in **then**. Afterwards follow the four *vocal consonants* **l**, **r**, **w**, **y**, as in the words **lull**, **rare**, **will**, **year**, none of them having corresponding whispered sounds. The list of consonants is then completed by what are termed the four *compound consonants*, each being composed of a combination of sounds; first, the *whisper* **x** (**ks**), as in the word **six**, with its *vocal power* **x** (**gz**), as in **exist**; and then the *whisper* **ch** (**tsh**), as in **rich**, with the *vocal sound* represented by **g** or **j** (**dzh**), as heard in the word **judge**.

In the fourth and fifth columns of the Alphabet are *seven short* and *seven corresponding long vowels*, their order being based upon the vocal organs in producing them, varying from the nearly-closed mouth in **ea**, as in the word **meat**, to the widest opening in **a**, as in **arm**; and again from the open-mouthed **au**, as in **caul**, to the nearly-closed and lip-protruding **oo**, as in **food**. The entire list is as follows, with the key-word attached to each:—

Short Vowels.		*Long Vowels.*	
1. **i**, **y**	as in **pity**.	1. **e-e**, **ea**	as in **mete**.
2. **e**	„ **pet**.	2. **ai**, **ay**, **a-e**	„ **paid**. „ **gay**. „ **sale**.
3. **a**	„ **pat**.	3. **a**	„ **arm**.
4. **o**	„ **pot**.	4. **au**, **aw**, **a**	„ **haul**. „ **drawl**. „ **call**.
5. **o**	„ **omit**.	5. **oa**, **o-e**	„ **boat**. „ **bone**.
6. **oo**, **u**	„ **good**. „ **full**.	6. **oo**, **u**	„ **moon**. „ **ruby**.
7. **u**	„ **but**.	7. **i**	„ **firm**.

The Alphabet is then completed by the *four compound vowels* or diphthongs, namely:—

1. **y**, **i-e**	as in **fly**. „ **file**.
2. **oi**, **oy**	„ **boil**. „ **boy**.
3. **ou**, **ow**	„ **bound**. „ **brow**.
4. **eu**, **ew**, **u-e**	„ **feudal**. „ **clew**. „ **dupe**.

The letters representing the same sound are placed within brackets in the order of usage, the first being the most frequent form of representation, and the next the less frequent, and so on. Thus the sound represented by one or other of the three letters **c**, **k**, or **q** may be said to have **c** for its *normal* letter, and not **k**, and still less **q**. In repeating the sounds the child is taught to speak of the *first*, *second*, or *third* **ké**, and so on in like manner of all the bracketed characters. The pronunciation of the vowel and consonantal letters which have more than one power is indicated by the use of various diacritical marks; as, for example, the letter **g** unmarked represents the sound heard in the word **gig**, while the **g** as sounded in **judge** is known by the dot over it. These marks are almost entirely used throughout the reading-book specially provided for the infants taught on this plan, while useless silent letters are printed in italics; thus the word 'tongues' is printed **tong*ues***. In the case of very irregular words, whose pronunciation cannot be precisely indicated either by the use of italics or marked letters, as the words **cough** and **enough**, they are at once told the child, as in the 'Look and Say' plan, for to spell them would be useless. Such words, fortunately, express such common notions, and occur so often, that they soon become impressed on the child's memory, and therefore offer little difficulty to his progress in reading.

In further continuing the subject, the value of the Phonic method may still better be shown by comparing it with other systems now in use; and in order that the differences of results may be more fairly attributed to differences of method, it must be premised that the teachers of each are equally skilful and painstaking, and that the pupils are of or about the same age and intelligence.

There are then four known methods of teaching to read; namely, the Alphabetic method, the system of Jacotot, or the Look and Say method, and the Phonetic and Phonic methods. Good reading may be taught by any one of these methods, but as they differ from each other very widely, it is a matter of importance to ascertain which of them effects its object best and in the least time.

The Alphabetic method teaches reading by spelling. The names of the letters are first learnt in their alphabetical order; then syllables of two sounds, as b-a, ba, b-e, be, b-i, bi, b-o, bo, b-u, bu, which give the long powers of the vowels united to a consonant; and a-b, ab, e-b, eb, i-b, ib, o-b, ob, u-b, ub, which give the short powers of the vowels united to a consonant; then words of more letters and sounds gradually increasing in difficulty; and lastly, easy and often very nonsensical sentences, such as, 'The hen met the big fat pig;' 'The pig met the hen;' 'The cat met the hen and the big fat pig,'—the fear appearing to exist that to give some really good reading exercises, matter would be introduced beyond the child's comprehension. Surely, if the teacher can secure from very young children distinct articulation, correct pronunciation, and other good qualities, a great deal has been done, although the sense of the passage may not be known. Words by the Alphabetic method become impressed on the memory by frequent repetition only, as the mere naming of the letters of which a word is composed seldom affords any clue to its pronunciation, and this, the oldest form of teaching reading, is the most unphilosophical of the four. Mr. Dunn, in his *Principles of Teaching*, speaking on this subject, says: 'The alphabet is usually the first subject presented to the notice of a child at school; and a more difficult or tiresome lesson he is never doomed to meet with in his whole future course. The *names* of the letters are unmeaning and arbitrary sounds. How can such an exercise be expected to produce anything but weariness and disgust?'

Again, to quote Mr. Blakiston: 'It is not easy to discover on what, if any principle the reading sheets and primers commonly used are based; but it is certain that in few schools as yet is the teaching of reading based on natural principles. Nothing but long habit could close teachers' ears to the absurdity of saying, "See oh double-you—cow," and so on. Such absurdities follow naturally from the practice of beginning by teaching children their letters, *i.e.* their *names* instead of their powers.'

Mr. Morrison, in his *Manual of School Management*, among other objections which he gives to this method, says: 'The names of the letters are seldom indicative of the sound. Thus the name sound of **h** (**aitch**) gives no indication whatever of the real sound of which the character **h** is the sign. And so in regard to all the consonants, the name of the letter or character is no index to the sound of which the letter is the sign. The name sound of **m** is **em**, but in pronouncing the word **me**, we never once think of pronouncing it as if it were **eme**. The name sound of **l** is **el**, but **leg** is never pronounced **eleg**. It happens accordingly that the child who has been taught the name sounds, finds himself utterly bewildered the moment he attempts to combine two letters into one syllable. He has been taught to call the sign **n**, **en**; but the instant the sign **n** takes an **o** after it, it undergoes a strange metamorphosis. It is no longer **en**, but something entirely and essentially different. Thus the reason of the child is outraged; he appears stupid, and the tyranny of school begins. This difficulty, more apparent in the case of the consonants, holds good even in that of the vowels. The name sound of any one of the vowels is not the sound which will meet the child in one case out of ten. Thus the name sound of **a** will guide the child to its correct sound in all those words in which the name sound occurs; but no sooner has such a word as **fat** made its appearance than the name sound becomes valueless as an exponent of the real sound of the mark **a** in the word **fat**. The name sounds are thus no true guides to the real sounds represented by the letters of the alphabet. We are not giving the child the means of interpreting the signs of sounds; we are causing him simply to repeat sounds with which he is perfectly familiar, and we are accustoming him to associate with these sounds certain characters which, when he comes to read, he will seldom, if ever, find associated with the same sounds.'

In the Look and Say method the pupil is instructed in reading words at sight without reference to the letters of which they are composed. It has been proved that those who cannot read may be taught to read without the medium of the alphabet, without syllabling words, and without spelling. The teacher places the lesson before the pupil, reads it slowly, and explains and illustrates it so as to interest the pupil. He then reads it again, the pupil saying the word after him. The teacher then reads entire sentences, after which the pupil is to repeat the

sentence, and so on by frequent repetition, until the lesson is perfectly learned. The words of frequent occurrence are soon recollected, and gradually less frequent words. The results of this method are entirely due to the memory alone, but doubtless reading is acquired by it sooner than by the Alphabetic method, inasmuch as it saves the time which has been shown to be wasted in learning the alphabet and the spelling of the words by the names of the letters. In the most irregular words of the language, it is impossible to give the instruction in any other way than by this method.

The Phonetic method provides a special alphabet of about six-and-thirty letters, one for each sound in the alphabet. A letter never represents any other sound than its own, and that sound is never represented by any other letter, and no double letters are allowed to stand for a simple sound. The simplicity and philosophical truth of the Phonetic method must lead to the acquirement of reading with more ease than by any other method whatever; and were all books written in Phonetic characters, there could be no doubt about this being the best method. But children must be able to read ordinary books; and the Phonetic plan has this disadvantage, that the pupil having learned to read Phonetic books, must undergo a process of transitional training from them to our ordinary literature.

The Phonic method in use here, as already shown in the explanation of the Alphabet, employs the *powers* or *sounds* of the letters in building up words and in reading them. By means of the marked letters, digraphs, and the printing of silent letters in italics, Mr. Robinson has rendered about three-fourths of the words in the language suitable for Phonic teaching. So that the system possesses almost the same simplicity as the Phonetic plan, but with the advantage of using ordinary type. When therefore the Alphabet or Table of Sounds has been thoroughly well learnt (and, as before intimated, this is comparatively soon done, and with little effort), the child by means of spelling arrives at once, without aid from the teacher, at the correct pronunciation of the word. The system is at once easy and pleasant to the child, and has none of the drudgery and wearisomeness to the teacher peculiar to some of the other methods. Moreover, the child is led to read with much greater distinctness and loudness than is usually the case, features which are found to be characteristic of the reading of the child throughout the whole of his future school course.

Before concluding with an account of the mode of proceeding with the teaching of Phonic reading in this infant school, it may be stated that the managers are still so convinced of the advantages of the method, that although having no interest in it beyond what it can do to aid the child in its learning, they are prepared to provide gratuitous instruction in the system to any teacher who may be desirous of giving it a trial.

This school has an average attendance of 132 children, and is taught by a staff of five teachers, including the mistress, three pupil teachers, and a monitor. The appliances used for carrying out the system are—a large Phonic alphabet $5\frac{1}{2}$ feet deep by 4 feet wide, with letters $2\frac{3}{4}$ inches deep, for the purpose of collective teaching: the letters being so large, are distinctly seen by the children from all parts of the gallery, where they are seated for the lesson; four alphabets on much smaller-sized cards for class teaching; two sets of Phonic vocabulary lesson sheets, containing a large collection of regular words of from one to four syllables, the set comprising 15 sheets in all; a few reading sheets with the marks of the system, to accustom the children to read in a straight line, to become acquainted with capital letters and with irregular words; fifty of the Phonic reading-books, as well as the same number of some other unmarked book, which the children use occasionally just before they are drafted into the upper schools.

Every morning a lesson is given on the Phonic alphabet by one of the teachers to all the children together. They first go through the sounds with the teacher, then by themselves, and afterwards individual children are called upon to repeat them. After all the sounds have been repeated in this way, the teacher pays special attention to a few of them, taking a few more for special notice in each succeeding lesson until the whole are well known. Strict attention is paid to the form of the mouth in making the sounds, and by this means the children are taught to articulate sounds which they are apt to give imperfectly. Spelling is always combined with this lesson, which may be given in several forms. Either the teacher points out certain sounds on the board, the children repeating them and then giving the word spelt; or without pointing to the letters, the teacher repeats the sounds, when the children follow with the word; or again, the teacher may give the word, and the children afterwards give the sounds composing it. A little silent spelling is sometimes given as an interesting variation of the lesson for the more advanced children. The teacher chooses a word in which the sounds may be recognised by the form of the mouth. She spells it without making the slightest sound, and the children having followed closely with the eye the teacher's mouth, give the word as soon as she has finished. In the class lessons the different stages taken are lessons on the alphabet, combination of sounds into easy words, the spelling of words from the Phonic vocabulary sheets in the order of their difficulty, and reading from the marked sheets as a preparation for the Phonic reading-book. After the children are put to reading this book, the lessons on the *vocabulary sheets* are still continued, the sheets being used occasionally instead of the books. It is found that this practice enables the children to combine the sounds so readily, that before leaving the infant school they are able to read the Phonic reading-book quite fluently, although in point of difficulty it will compare with most Fourth Standard reading-books.

Recent Inspection Questions.

[*The Editor respectfully solicits contributions to this column. For obvious reasons, it cannot be stated in which district the questions have been set.*]

Physical Geography.

STAGE I.

(1) What is evaporation? On what does its amount depend?

(2) Tell the limits of the Tay and Esk basin.

(3) What is evaporation? How is it produced?

(4) What is a fog? What is the difference between a cloud and a fog? What kind of night does it need to produce fogs?

(5) What are the limits of the Tay and Esk basin? What counties do they flow through? also what subordinate rivers does it include?

(6) Pure air consists of two gases mixed together. Of what else does it consist? Take 100 lbs. air; how much is oxygen?

STAGE II.

(1) When are tides highest—(1) at the poles; (2) at the Equator? Give reasons for your answer.

(2) Draw out a table showing the length, breadth, and depth of the five great oceans.

(3) What are the ingredients of salt in the ocean? How much per cent. are there of these ingredients?

(4) Where does the Arctic current start from, and how does it affect the climate of Central America?

(5) How can we tell the depth of the ocean by the coast?

(6) What is a tide bore? Where do tides originate, and what are they?

STAGE III.

(1) Why is daylight longer in summer than in winter?

(2) What causes the total eclipse of the sun?

(3) What is the earth? Give the polar and equatorial diameters.

(4) How do you account for the different shapes which the moon has between new and full?

Arithmetic.

STANDARD I.

(1) Add together:—Three hundred and ninety-two, four hundred and nine, eight hundred and sixteen, nine hundred and five. Ans. 2522.

(2) Add together:—Twenty-seven, nine hundred and fourteen, thirty-two, five hundred and nine, sixty-two. Ans. 1544.

(3) Add together:—Eight, ten, four hundred and ninety-two, seventeen, six, twenty-three. Ans. 546.

(4) Subtract:—One hundred and fifty-nine from four hundred and ninety-two. Ans. 333.

STANDARD II.

(1) From forty thousand two hundred and ninety-three take fourteen thousand one hundred and fifty-six. Ans. 26,147.

(2) Take one thousand four hundred and forty-two from thirty thousand nine hundred and forty-one. Ans. 29,499.

(3) Multiply forty-nine thousand six hundred and ninety-three by four hundred and eight. Ans. 20,274,744.

(4) Multiply seventy-nine thousand eight hundred and thirty-seven by thirty-nine. Ans. 3,113,643.

(5) Divide fifty thousand and ninety-two by nine. Ans. 5565 + 7.

STANDARD III.

(1) Add together seventy-six shillings, ninety-eight sixpences, two hundred and twenty-seven pence, and four hundred and thirty-eight farthings. Ans. £7, 13s. 0½d.

(2) Find the difference between seventy-eight pounds sixteen shillings and sixpence and five hundred pounds. Ans. £421, 3s. 6d.

(3) From eight hundred and ninety-six pounds sixteen shillings and eightpence farthing take five hundred and seventy-nine pounds nineteen shillings and sixpence farthing. Ans. £316, 17s. 2d.

(4) What change ought I to receive from a ten-pound note after paying two bills, one seven pounds and a penny halfpenny, and the other one pound six shillings and elevenpence? Ans. £1, 12s. 11½d.

(5) Find how much greater the sum of one thousand and twenty pounds five shillings and twopence is than eight hundred and seventy-six pounds thirteen shillings and ninepence farthing. Ans. £143, 11s. 4¾d.

(6) Subtract seven thousand three hundred and ninety-seven pounds seventeen shillings and eightpence halfpenny from ten thousand and sixty pounds eightshillingsandsevenpence. Ans. £2662, 10s. 10½d.

STANDARD IV.

(1) Divide three thousand eight hundred and fifty-six pounds thirteen shillings and sevenpence by nine. Ans. £428, 10s. 4¾d. + 1.

(2) Reduce twenty-seven cub. yds. twelve ft. six inches to cubic inches. Ans. 1,280,454.

(3) Find the value of a cwt. of tea at three shillings and fourpence per lb. Ans. £18, 13s. 4d.

(4) Find a man's wages for a year at seventeen shillings and sixpence per week. Ans. £45, 10s. 0d.

(5) Reduce sixteen tons three qrs. seventeen lbs. to lbs. Ans. 35,941 lbs.

(6) How many galls. of ale or beer are there in twenty-seven thousand and fifty-three pints? Ans. 3381 galls. 2 qrs. 1 pt.

STANDARD V.

(1) Three hundred and ninety at five pounds nine shillings and fourpence halfpenny each. Ans. £2132, 16s. 3d.

(2) Eight cwt. two qrs. twelve lbs. at two pounds twelve shillings per cwt. Ans. £22, 7s. 6¾d.

(3) One thousand nine hundred and thirteen articles at two pounds sixteen shillings and tenpence halfpenny. Ans. £5440, 1s. 10½d.

(4) Four tons seventeen cwt. two qrs. at two thousand four hundred pounds per ton. Ans. £11,700.

(5) One thousand two hundred and ninety-six articles at sixteen shillings and tenpence halfpenny each. Ans. £1093, 10s.

(6)

	£	s.	d.
25 lbs. sugar at 6½d. per lb.,	0	13	6½
3 chests each 112 lbs. at 1½d. per lb.,	2	2	0
4 lbs. coffee at 1s. 1d. per lb.,	0	4	4
Ans.	£2	19	10½

STANDARD VI.

(1) If forty-six horses eat fifty qrs. of oats in sixty-four days, how many days would it take seventy-five horses to eat one hundred and twenty qrs.? Ans. 94 days 5 hrs. (nearly).

(2) Reduce ·0064 to a vulgar fraction, and express $\frac{7}{125}$ as a decimal. Ans. $\frac{8}{125}$ and ·056.

(3) Take 340·567 from 704·056, and divide the answer by ·25. Ans. 1453·956.

(4) Divide £1, 10s. 6d. by $5\frac{3}{5}$. Ans. 5s. 4½d. + 6.

(5) If seven tons of coal would supply three fires for nine months, how long will twelve tons supply five fires? Ans. 9 months 1 week 0 days 4 hrs. + 28.

(6) If 125 cost £39·51, what will 6·8 cost? Ans. £2, 2s. 11¾d.

Grammar.

STANDARD IV.

Parse—(*a*) She led him gently away from their mother's gaze.

(*b*) The nightingale is a very plain bird which has nothing in its appearance to attract us.

(*c*) The people living in these very cold regions have a carriage called a sledge for travelling about from place to place.

STANDARD V.

Analyze the following passages, and parse fully the words in italics:—

(*a*) With fire and *sword* the country *round* was wasted *far* and wide.

(*b*) Lapland *being very cold*, its waters are frozen *over* a great *part* of the year.

(*c*) *Really it* is *very wrong* of you *to grieve over* your misfortunes.

STANDARD VI.

Parse and analyze:—

(*a*) When the cat is away the mice play.

(*b*) With his spade across his shoulder to the field the workman goes.

Write a short account of the seasons.

—o—

Matriculation Chemistry.

BY E. W. V. VOLCKXSOM,

Lecturer on Chemistry at St. Gregory's College, Downside, Bath.

PRELIMINARY NOTIONS.

ELEMENTS, CHEMICAL COMBINATIONS, LAWS OF COMBINATION.

ACIDS, BASES, AND SALTS. SYMBOLS AND NOMENCLATURE.

1.* What is the **object** of the science of Chemistry?

Chemistry has for its **object** the investigation of the *composition* of different kinds of matter, and the *changes* in the composition which result from the action of one kind of matter upon another, or of external forces upon matter.

2.* In what does Chemistry differ from the science of **Natural Philosophy**?

It differs in this, that **Natural Philosophy** investigates the *properties* of all bodies, and the *changes* these bodies undergo, except changes of composition.

3.* By what **processes** does Chemistry attain its object?

By the processes of **analysis** and **synthesis**.

4.* In what does the process of **analysis** consist?

It consists in **resolving** compound bodies into more simple bodies.

5.* In what does the process of **synthesis** consist?

It consists in **building up** a compound body from more simple bodies.

6.* By what **name** are those bodies called that have hitherto resisted *analysis* or *decomposition* into more simple bodies?

They are called **elements**. The number of clearly defined elements is about sixty-five.

7. Why do you call oxygen, hydrogen, and carbon, **chemical elements**? *June*, 1871.

Because these bodies have **not been decomposed** into two or more other bodies.

8. Explain why **oxygen, hydrogen, nitrogen,** and **carbon** are considered to be *elements*. Describe one experiment by which you could prove that **diamond** and **graphite** consist of the same element. *Jan.* 1867.

These bodies are considered to be *elements*, because, in the present state of science, they cannot be decomposed into two or more substances.

Diamond and **graphite** consist exclusively of the element carbon, because, if each substance be completely burned in oxygen, the result is the same, namely, the production of **carbonic acid**, as may be proved by passing the gas into lime-water, when a white precipitate is produced in each case.

9. Why are **oxygen** and **mercury** considered to be chemical elements? *June*, 1879.

Because they are not known to contain any other elements but oxygen and mercury respectively, or because the actual state of science has not enabled any one to decompose them into two or more elements.

10. What are the principal distinctions between **metallic** and **non-metallic** elements? *July*, 1844.

The elements have been divided for convenience into two classes, namely, the metallic and the non-metallic elements. This division is not rigorous, for the two classes run into each other. The

* The numbers to which asterisks are attached indicate questions not yet asked in the London University papers, but inserted here in order to supply a somewhat complete chemical course.

principal distinctions may be thus noted: the **non-metallic elements** are electro-negative, have no metallic lustre, have a low specific gravity, and are bad conductors of heat and electricity; the **metallic elements** are electro-positive, have metallic lustre and a high specific gravity, and are good conductors of heat and electricity.

11. Define the expressions **chemical affinity** and **cohesion**. *July*, 1857.

Chemical affinity is the force which causes different kinds of matter to combine, that is to say, to form compounds differing in their properties from the original substances. The act of union is called **chemical combination**, and the body resulting from this union is called a **chemical compound**. This force acts between atoms, or the smallest conceivable particles. **Cohesion** is the force which causes the various parts of a body to adhere together, so as to resist separation. This force acts between larger masses of matter than *atoms*.

12.* What is a **mixture**?

A **mixture** is the mechanical union of two or more bodies in no one definite proportion, each body, moreover, being present with its own composition and properties, without having undergone any change.

13. Two powders are given you: one is a mechanical **mixture**, the other a **chemical combination**, of sulphur and iron. In what respects would the powders differ, and by what chemical reactions could you distinguish the one from the other? *Jan.* 1876.

A given powder is composed of 32 gr. of sulphur and 50 gr. of iron. How would you ascertain whether the powder is a mechanical **mixture** or a **chemical combination** of the two elements? *June*, 1878.

The two powders would differ in their physical appearance. The mechanical **mixture** would be easily pulverized, and would be of a greyish appearance. The **chemical combination** would be hard, and of a blackish colour. The two powders would also differ in their chemical properties.

To ascertain which is the mixture and which the combination, I would first reduce both to powder, and hold a magnet near each. In one the free iron would at once be attracted by the magnet, whereas the combined iron in the other could not be attracted.

Also, I would pour on the two powders some diluted hydric chloride. In the case of the **mixture**, hydrogen would be generated, whilst in that of the **chemical combination**, hydric sulphide would be given off.

Again, the powders may be stirred up in water. After a part has been allowed to settle, the liquid should be poured off and allowed to settle again. In the **mixture** the first sediment is chiefly iron, the second sulphur; in the **compound** there is no difference in the nature of the sediment.

Carbonic disulphide dissolves sulphur from the **mixture**, but not from the **compound**.

Under the microscope, particles of iron and sulphur are distinguished in the **mixture**, but not in the **compound**.

14. A gas is found by analysis to consist of equal volumes of chlorine and hydrogen. Describe fully how you find by experiment whether the gas is a mechanical **mixture** or a **chemical combination** of the two elements. *Jan.* 1875.

I would find it out by the following experiments:—

(1.) If the gas fumes when exposed to the air, the two elements are chemically **combined**.

(2.) If a greenness is still discernible, then the gases are **not combined**.

(3.) If a light be applied to the jar containing the gases, or the jar be exposed to the direct rays of the sun, and an explosion ensues, then the two gases were present merely as a **mixture**.

(4.) If, when a rod dipped in ammonia is applied to the opening of the jar, white fumes begin to form, the two gases are in **chemical combination**.

15. Explain what is meant by a **double decomposition**, taking the decompositions which occur on mixing solutions of sulphate of soda and nitrate of barytes, or any other instance in illustration. *July*, 1846.

By **double decomposition** is meant the fact that both bodies decompose, the acid of the one combining with the base of the other. Thus, for instance, mix a solution of sodic sulphate with baric nitrate. A white precipitate of *baric sulphate* is formed, which in a short time settles at the bottom of the vessel, sodic nitrate remaining dissolved.

$$\underset{\text{Sodic sulphate.}}{Na_2SO_4} + \underset{\text{Baric nitrate.}}{BaN_2O_6} = \underset{\text{Baric sulphate.}}{BaSO_4} + 2\underset{\text{Sodic nitrate.}}{NaNO_3}.$$

16.* Explain in a few words in what the **atomic theory** consists.

It consists in the *conjecture* that all bodies are composed of a finite but very great number of invisible and indivisible particles (*atoms*); that for each kind of element these particles are identical in shape, size, and weight, but differ in different kinds of bodies. The actual shape, size, and weight of one of these particles are unknown, but the relative weight of the particles of different bodies is known, and this constitutes the *relative weight* or *atomic weight* of the bodies. This theory was devised and framed by Dalton, in order to explain *the laws of chemical combination*.

17.* Define an **atom** and a **molecule**.

An **atom** is the smallest quantity of an element capable of existing in combination.

A **molecule** is the smallest quantity of a substance capable of existing in a free state.

18. What is meant by combination in **definite** and **multiple proportions**? *July*, 1845.

The law of **definite** or of **constant proportions** may be thus expressed:—

The same substance always consists of the same elements united in the same proportions.

Thus, for example, water is composed of hydrogen and oxygen in the proportion of two atoms of hydrogen to one of oxygen. This by weight makes 2 grammes or grains, etc., of hydrogen to 16 grammes or grains, etc., of oxygen, making 18 grammes or grains, etc., of water; and these elements are found in water invariably in the same identical proportions and in no other. Again, common salt always contains 35·5 parts by weight of chlorine to 23 parts by weight of sodium; and vermilion contains 32 parts by weight of sulphur to 200 of mercury.

19. Illustrate the law of **multiple proportions** by a series of examples, including compounds of carbon with oxygen, carbon with hydrogen, sulphur with oxygen, nitrogen with oxygen. *June*, 1865.

State the doctrine of **multiple proportions**, and explain it by examples. *July*, 1844.

A body capable of combining with another in several proportions, those several proportions bear a simple relation to each other.

(1.) Thus, take for example the compounds of **carbon** with **oxygen**:—

Carbonic oxide,

CO . . 12 of C with 16×1 of O.

Carbonic dioxide,

CO_2 . . 12 of C with 16×2 of O, or 32 of O.

Thus the oxygen in the CO and CO_2 stand to one another as 1 : 2.

(2.) The compounds of **carbon** with **hydrogen**, limiting them to two:—

Light carburetted hydrogen,

CH_4 . . 4 of H with 12 × 1 of C.

Heavy carburetted hydrogen,

C_2H_4 . . 4 of H with 12 × 2, or 24 of C.

Thus the carbon in the CH_4 and C_2H_4 stand to one another as 1 : 2.

(3.) The compounds of **sulphur** with **oxygen**:—

Sulphurous dioxide,

SO_2 . . 32 of S with 16 × 2, or 32 of O.

Sulphuric trioxide,

SO_3 . . 32 of S with 16 × 3, or 48 of O.

Thus the oxygen in SO_2 and SO_3 stand to one another as 2 : 3.

(4.) The compounds of **nitrogen** with **oxygen**:—

Nitrous oxide,

N_2O . . 28 of N with 16 × 1 of O.

Nitric oxide,

N_2O_2 . . 28 of N with 16 × 2, or 32 of O.

Nitric trioxide,

N_2O_3 . . 28 of N with 16 × 3, or 48 of O.

Nitric tetroxide,

N_2O_4 . . 28 of N with 16 × 4, or 64 of O.

Nitric pentoxide,

N_2O_5 . . 28 of N with 16×5, or 80 of O.

Thus the oxygen of N_2O, N_2O_2, N_2O_3, N_2O_4, N_2O_5, stand to each other as 1 : 2 : 3 : 4 : 5.

20. Explain the laws of combination in **equivalent** and **multiple proportions**. *July*, 1855.

The law of **multiple proportions** has been expressed and explained in the previous number.

The law of **equivalent proportions** may be expressed thus:—

If two bodies combine with a third, the proportions in which they combine with that third body are multiples of the proportions in which they may combine with each other.

That is to say, supposing a certain weight of a body A combine with a certain weight of the bodies B, C, D; then if B, C, D unite with each other, they will do so in the same proportion by weight as that in which they combine with A, or in some multiple of that proportion.

Thus 1 part of hydrogen combines with 32 of sulphur and with 16 of oxygen: therefore, when sulphur and oxygen combine, it will be in the proportion of 32 : 16, or in some multiple of those numbers.

21.* Express the law of **molecular weights**, and give an example.

The combining weight of a compound is the sum of the combining weights of the components.

Thus the combining weight of hydric chloride is 36·5, which is the sum of the combining weight of hydrogen 1, and that of chlorine 35·5.

22. Explain what is understood by the **theory of volumes**. *Jan.* 1860.

A molecule of any substance, in the state of gas or vapour, occupies the same volume as a molecule, or two atoms, of hydrogen does. This is generally expressed by saying that *the molecular volume of a gas is 2 vols., or*

The chief exceptions are—

N_2O_2, ; N_2O_4, to ;

Cl_2O_4, ; PCl_5, ;

H_2SO_4, ; NH_4Cl, .

23. What is meant by the expression **atomic weight**? *July*, 1856.

The **atomic weights** of the **elements** are the *relative* weights in which the elements combine with one another, whether according to those actual proportions, or multiples of those proportions. The atomic weights are generally referred to hydrogen, which as *the standard* is assumed to have the atomic weight of 1. The numbers may stand for grammes or grains, or any other actual weight, as circumstances require.

(*To be continued.*)

THE CUCKOO'S CALL.

Words by GEORGE BENNETT.
Music by T. CRAMPTON.

Allegretto.

1ST TREBLE.
2D TREBLE.
BASS.

1. Up, up, 'tis the call of the cuckoo, the cuckoo, To her-ald the sea-son we love; We'll a-
2. 'Tis lit - tle we know of the cuckoo, the cuckoo, If he comes from the east or the west; But for
3. We greet the first call of the cuckoo, the cuckoo, Tho' we heard man-y birds ere he came; O - ver

KEY A. E. t.

1ST TREBLE.	:s_1	m :- :m.m	m :m :m	s :m :	: :m.m	m :r :r	r :m :r	d :- :-	- :m :^{m}l
2D TREBLE.	:s_1	s_1 :- :s_1.s_1	s_1 :s_1 :s_1	s_1 :s_1 :s_1	m :d :s_1.s_1	l_1 :l_1 :l_1	t_1 :s_1 :f_1	m_1:- :-	- :s_1 :^{s}d
BASS.	:s_1	d :- :d.d	d :d :d	m :d :m	s :m :d.d	f_1 :f_1 :f_1	s_1 :s_1 :s_1	d :- :-	- :d :^{d}f

way and re - joice, As we list to his voice, Gen - tly coo - ing his name up a - bove,
thros-tle or lark, Ne'er so eag - er we hark, As we do for the bird we love best,
mea - dow and vale, His sweet wel - come we hail, As he three times re - peats his own name,

	l :s :s	d^1 :s :s	f :m :r	s :m :s	s :f :l	s :d^1 :t	d^1:- :-	- :- :
	t_1 :t_1 :t_1	d :d :d	d :d :t_1	d :d :d	d :d :d	m :m :r	m :- :-	- :- :
	f :f :f	m :m :m	l :s :f	m :s :m	l :l :f	s :s :s	d :- :-	- :- :

'Cuc - koo! cuc - koo! cuc - koo! cuc - koo!' As lone - ly and shy as a dove,
'Cuc - koo! cuc - koo! cuc - koo! cuc - koo!' We prize it a - bove all the rest.
'Cuc - koo! cuc - koo! cuc - koo! cuc - koo!' In song we would ech - o the same.

f. A. *p* *p*

	d^1s :m :	: :	f :r :	: :s_1	s_1 :l_1 :t_1	d :r :m	f :- :-	- :- :
	^{1}m :d :	m :d :	r :t_1 :	r :t_1 :s_1	s_1 :fe_1 :f_1	s_1 :t_1 :d	t_1 :- :-	- :- :
	: :	d^1s :m :	: :	t_1 :s_1 :t_1	t_1 :d :r	m :r :d	r :- :-	- :- :

'Cuc - koo! cuc - koo! cuc - koo! cuc - koo!' As lone - ly and shy as a dove,
'Cuc - koo! cuc - koo! cuc - koo! cuc - koo!' We prize it a - bove all the rest.
'Cuc - koo! cuc - koo! cuc - koo! cuc - koo!' In song we would ech - o the same.

	s :m :	: :	f :r :	: :s	s :f :m	r :m :r	d :- :-	- :-
	m :d :	m :d :	r :t_1 :	r :t_1 :r	$\bar{d}$:r :d	t_1 :s_1 :f_1	m_1:- :-	- :-
	: :	s :m :	: :	f :r :t_1	$\bar{l}_1$:t_1 :d	s_1 :s_1 :s_1	d :- :-	- :-

'Beautiful Spring,' the song which appeared in No. 1, *can be had separately at* 6*d. per dozen, post free.*

Pupil Teacher's Examination Questions.

FEBRUARY 1881.

CANDIDATES.

Three hours and a half allowed.

Arithmetic.

MALES.

1. What should be given for 5 cwt. 3 qrs. 10½ lbs. of tea, when 59½ lbs. are worth £10, 8s. 3d.?
2. Ascertain by practice the value of 2897 articles, at £2, 12s. 9½d. each.
3. Find the cost of draining a field of 58 acres 2 roods when a field of 2 roods 24 poles cost £3, 3s. 6d.
4. What is the dividend on £4975 at 3s. 4½d. in the £? and what is the cost of 5783 articles at £14, 9s. 6½d. each? Add the two sums together.
5. Find the value of a piece of mahogany 18 feet long, 1 ft. 9 inches deep, and 1 ft. 4 inches wide, at 2s. 9½d. per cubic foot.

FEMALES.

1. Make out a bill for the following:—

			s.	d.	
15 gross	of	penholders	at 0	9½	per dozen.
45 doz.	,,	inkstands	,, 3	6	each.
75 reams	,,	blotting paper	,, 0	10	per quire.
510 ,,	,,	scribbling	,, 0	9	,,
60 gross	,,	pencils	,, 1	1½	per doz.
90 doz.	,,	pen-knives	,, 1	4½	each.

2. Find the cost of 613882 articles at £17, 3s. 1½d. each.
3. Find the value of 1492⅞ cwt. at £15, 18s. 6d. per cwt.
4. What will be the price of 189 yds. 0 ft. 11 in. of silk at 5s. 3½d. per yard?

Grammar.

1. Point out and parse all verbs and adjectives in the following:—

> 'Tis sweet to hear the sheep-dog's honest bark
> Bay deep-mouthed welcome as we near our home;
> 'Tis sweet to know there is an eye will mark
> Our coming, and look brighter when we come.'
>
> BYRON.

2. The imperative mood can only be used, strictly speaking, in the second person. Why is this? How is an imperative expressed with the first and third person?
3. When is the plural of nouns formed by simply adding *s*? In what cases must *es* be added? Give examples.

Geography.

1. Mention the different names applied to *inlets* and narrow passages of water on the coast of Great Britain, and give an example of the use of each of them.
2. In what parts of Ireland are the counties of Mayo, Donegal, and Wicklow? Say what you know about each of them.
3. Explain the following statement, and show that it is true:—

'*There is a striking difference between the mountains of the Pennine Chain and those of the Cumbrian Group in almost every respect—in their general appearance, in the character of their scenery, the number and size of their lakes and rivers, besides the great difference which is expressed by the words Chain and Group.*'

Composition.

Write from dictation the passage given out by the Inspector.

Penmanship.

Write, in large hand, as a specimen of copy-setting, the word *Sheriffdom*.

Write, in small hand, as a specimen of copy-setting, '*If son to Talbot, die at Talbot's foot.*'

Music.

A quarter of an hour allowed for this paper.

1. Write over each of the following notes its pitch name (C, D, *Do*, *Re*, or other), and under each its duration name (crotchet, quaver, or other):—

2. Follow each of these notes by its corresponding rest:—

3. How many tones and semitones are found in a major scale, and what are the places of the latter?

ANSWERS.—CANDIDATES.

Arithmetic.

MALES.

1. 59½ lbs. : 5 cwt. 3 qrs. 10½ lbs. :: £10, 8s. 3d.,
or 119 half lbs. : 1309 half lbs. :: 2499d.

$$\frac{1309 \times 2499\text{d.}}{119} = 27489\text{d.} = £114,\ 10\text{s.}\ 9\text{d.}\ \text{Ans.}$$

2.

	£	s.	d.	
	2897	0	0	
			2	
	5794	0	0	= value of 2897 at £2.
10s. = ½ of £1	1448	10	0	= ,, 10s.
2s. 6d. = ¼ of 10s.	362	2	6	= ,, 2s. 6d.
3d. = 1/10 of 2s. 6d.	36	4	3	= ,, 3d.
¼d. = 1/12 of 3d.	3	0	4¼	= ,, ¼d.
	£7643	17	1¼	= value of 2897 at £2, 12s. 9½d.

3. 2 ro. 24 po. : 58 ac. 2 ro. :: £3, 3s. 6d.,
or 104 po. : 9360 po. :: 762d.

$$\frac{9360 \times 762\text{d.}}{104} = 68580\text{d.} = £285,\ 15\text{s.}\ \text{Ans.}$$

4. (1)

	£	s.	d.	
	4975	0	0	
3s. 4d. = ⅓ of £1	829	3	4	= dividend on £4975 at 3s. 4d.
½d. = 1/80 of 3s. 4d.	10	7	3½	= ,, ,, ½d.
	£839	10	7½	= dividend on £4975 at 3s. 4½d.

(2)

	£	s.	d.	
	5783	0	0	
			14	
	23132	0	0	
	5783	0	0	
	80962	0	0	= cost at £14.
5s. = ¼ of £1	1445	15	0	= ,, 5s.
4s. = ⅕ of £1	1156	12	0	= ,, 4s.
6d. = 1/40 of 4s.	144	11	6	= ,, 6d.
½d. = 1/12 of 6d.	12	0	11½	= ,, ½d.
	83720	19	5½	= cost at £14, 9s. 6½d.
	839	10	7½	
	£84560	10	1	= two sums added together.

5. 18 ft. × 1 ft. 9 in. × 1 ft. 4 in.
= 216 in. × 21 × 16
= 72576 cubic in.
= 42 cubic ft.,

and 42 ft. at 2s. 9½d. per ft. = £5, 17s. 3d. Ans.

FEMALES.

		s.	d.		£	s.	d.
1.	15 gross at	0	9½	per doz. =	7	2	6
	45 doz. at	3	6	each =	94	10	0
	75 reams at	0	10	per quire =	62	10	0
	510 reams at	0	9	,, =	382	10	0
	60 gross at	1	1½	per doz. =	40	10	0
	90 doz. at	1	4½	each =	74	5	0
				Total =	£661	7	6

2.

	£	s.	d.	
	613882	0	0	
			17	
	4297174	0	0	
	613882	0	0	
	10435994	0	0	= cost at £17.
2s. = $\frac{1}{10}$ of £1	61388	4	0	= ,, 2s.
1s. = $\frac{1}{2}$ of 2s.	30694	2	0	= ,, 1s.
1½d. = $\frac{1}{8}$ of 1s.	3836	15	3	= ,, 1½d.
£	10531913	1	3	= cost at £17, 3s. 1½d.

3.

	£	s.	d.	
	1492	0	0	
			15	
	7460	0	0	
	1492	0	0	
	22380	0	0	= value at £15 each.
10s. = $\frac{1}{2}$ of £1	746	0	0	= ,, 10s. ,,
5s. = $\frac{1}{2}$ of 10s.	373	0	0	= ,, 5s. ,,
2s. 6d. = $\frac{1}{2}$ of 5s.	186	10	0	= ,, 2s. 6d. each.
1s. = $\frac{1}{5}$ of 5s.	74	12	0	= ,, 1s. ,,
$\frac{1}{4}$ of £15, 18s. 6d.	13	18	8½	= value of $\frac{1}{4}$ cwt.
£	23774	0	8½	= value of 1492¼ at £15, 18s. 6d.

4.

	£	s.	d.	
	0	5	3½ × 9	
			10	
	2	12	8½ × 8	
			10	
	26	7	1	
	2	7	5½	
	21	1	8	

	49	16	2½	= value of 189 yds. at 5s. 3½d.	
9 in. = $\frac{1}{4}$ of 1 yd.		1	3$\frac{2}{4}$ $\frac{1}{4}$	= ,,	9 in. ,,
1 in. = $\frac{1}{9}$ of 9 in.			1$\frac{2}{4}$ $\frac{1}{9}$	= ,,	1 in. ,,
1 in. = $\frac{1}{9}$ of 9 in.			1$\frac{2}{4}$ $\frac{1}{9}$	= ,,	1 in. ,,
£	49	17	9½ 1½	= value of 189 yds. 11 in. at 5s. 3½d.	

Grammar.

1. *is*—irreg. incomplete verb *am, was, been*, pres. ind. 3d pers. sing. agr. with subj. *it*.
sweet—adj. qual. *it*.
to hear—irreg. trans. verb *hear, heard, heard*, pres. inf.
sheep—noun used as adj. qual. *dog*.
honest—adj. qual. *bark*.
bay—reg. trans. verb pres. inf. (*to* omitted after *hear*).
deep-mouthed—adj. qual. *welcome*.
near—reg. trans. verb pres. ind. 1st pers. plu. agr. with subj. *we*.
our—pronom. adj. qual. *home*.
is—(same as before).
sweet—(same as before).
to know—irreg. trans. verb *know, knew, known*, pres. inf.
is—irreg. incomplete verb, etc. agr. with subj. *eye*.
will mark—reg. trans. verb, future ind. 3d pers. sing. agr. with subj. *which*.
our—pronom. poss. adj. qual. *coming*.
(*will*) *look*—reg. intrans. verb, future ind. 3d pers. sing. agr. with subj. *which*.
brighter—adj. with some adverbial force qual. *eye*.
come—irreg. intrans. verb *come, came, come*, pres. ind. 1st pers. plu. agr. with subj. *we*.

2. When we address persons directly, we use the second person; and since a direct command is equivalent to an address, therefore strictly speaking the *imperative* mood can only be used in the second person.

The *first* and *third* person of the imperative may be expressed by means of *let* and an *infinitive*, as, *Let me go; Let him come.*

3. The plural of nouns is generally formed by adding *s* to the singular, but *es* must be added when the singular ends in *s, x, sh, ch* soft, *z*, or *o* preceded by a consonant (with few exceptions), as *lass, lasses; brush, brushes; match, matches; topaz, topazes; fox, foxes; hero, heroes.* Nouns ending in *y*, preceded by a consonant or by *u*, change *y* into *i* and add *es*, as *lady, ladies; soliloquy, soliloquies.* Some nouns ending in *f* or *fe* change the *f* or *fe* into *ves*, as *loaf, loaves; life, lives.*

Geography.

1. The different names given to openings in the land on the coasts of Great Britain and Ireland are:—
Frith—as Frith of Clyde, separating Ayr and Renfrew from Bute, Argyle, and Dumbarton.
Mouth—as Mouth of the Thames, between Essex and Kent.
Bay—Cardigan Bay, west of Cardigan and Merioneth.
Loch—Loch Ryan, north-west of Wigtownshire.
Lough—Lough Swilly, north of Donegal.
Harbour—Waterford Harbour, between Wexford and Waterford.
Haven—as Milford Haven, west of Pembroke.
River—in the case of Kenmare river, west of Kerry.
Names given to narrow passages of water:—
Channel—as North Channel, between Scotland and Ireland.
Strait—Straits of Dover, between Kent and France.
Sound—Sound of Mull, between Mull and Argyle.
Kyle—Kyles of Bute, between Bute and Argyle.
Peculiar are—(1) The *Narrows* of Skye. (2) The *Pentland Frith*.

2. *Mayo*, a maritime county in west of Ireland and north-west corner of the province of Connaught, bounded on west and north by the Atlantic. Its county town is Castlebar. The county is traversed by a range of mountains, but there is a great variety of surface. The coast is much indented by bays. Loch Mask is now memorable as being close to the estate of Captain Boycott, who had to be protected by the Government, 1880.

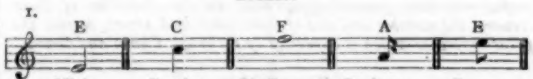
Donegal, a maritime county in the north of Ireland, bounded on west and north by the Atlantic. It occupies the north-west corner of the province of Ulster. It has a mountainous and boggy surface. The coast is much broken by inlets, the chief being *Loughs Foyle, Swilly*, and *Donegal Bay*. There are many unimportant rivers, the chief being the *Foyle* and the *Swilly*. The county town is *Lifford*. Many of the population work at muslin-weaving.

Wicklow, a maritime county of Ireland, bounded on the south by the Atlantic, and east by the Irish Sea. It lies in the south-east corner of Leinster province, and is one of the most picturesque counties in the country. It is very mountainous. The principal rivers are the *Liffey* and the *Slaney*. The pursuits of the people are chiefly agricultural. Wicklow is the county town.

3. The general appearance of the Pennine Chain and of the Cumbrian Group forms a striking contrast. The former consists of a chain of rounded hills or moors extending for two hundred miles, and ending with the picturesque group of the Peak in Derby. The latter consists of a small, compact, circular mass of mountains having a more rugged aspect than the hills in any other part of England. The Pennines have no lakes, but they give rise to many considerable rivers, such as the Tyne, the Wear, the Tees, the numerous branches of the Yorkshire Ouse, all flowing easterly, and the Mersey flowing west. On the other hand, the Cumbrian Mountains give rise to a few unimportant streams, of which the Derwent and Eden are alone worthy of notice; but in their narrow valleys lies a series of the most beautiful lakes, the chief being Keswick Lake, Windermere, and Ulleswater. From this fact the region takes the name of the Lake District.

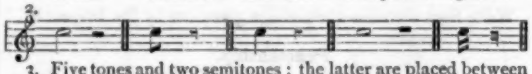
Music.

1.



Minim. Crotchet. Semibreve. Semiquaver. Quaver.

2.



3. Five tones and two semitones; the latter are placed between the third and fourth and seventh and eighth notes of the scale.

FIRST YEAR.

Pupil-Teachers at end of First Year.

Three hours and a half allowed.

Arithmetic.

MALES.

1. Express £1, 4s. 10$\frac{3}{4}$d. as the decimal of £3, 19s. 8d.

2. Add together 2$\frac{3}{4}$ acres 7$\frac{1}{2}$ roods 3$\frac{1}{4}$ poles and 25$\frac{1}{4}$ yards, and find the value of the whole at 5·25 shillings per square yard.

3. Subtract 11s. 9d. from the sum of $\frac{3}{5}$ of a guinea, £$\frac{3}{8}$, and $\frac{1}{4}$ of 5s., and express the result as the fraction, vulgar *and* decimal, of £1, 5s. 0d.

4. What (improper) fraction taken from $3\frac{1}{4}$ of $\frac{3}{5}$ will leave ·006?

5. Find the value of 2·425 of 5 cwt. 3 qrs. 16 lbs., at £5 per ton. Answer to decimals of a penny.

FEMALES.

1. A bankrupt's debts amount to £2000, and his property to £775; what will each of his creditors lose in the pound?

2. In what time ought 10 men to perform the same work, which 5 men and 5 boys can do in 15 days, it being given that 3 men can perform the same amount of work as 5 boys?

3. If 100 horses consume a stack of hay 20 ft. long, 11 ft. 3 in. broad, and 31 ft. 6 in. high in 9 days; how long will a stack 18 ft. long, 5 ft. broad, and 14 ft. high supply 80 horses?

4. Find the cost of one million five hundred and ninety-two thousand four hundred and forty-eight articles at £174, 1s. 10½d. each.

Grammar.

1. Parse all the pronouns in the following:—

'That face is thine: thine own sweet smile I see,
The same that oft in childhood solaced me.'—COWPER.

2. Give examples of adverbs which are followed by the dative case.

3. Relative pronouns are said to have a twofold use—(1) to limit and define the antecedent; (2) to introduce some additional statement, when the principal sentence is complete already. Give examples of each use.

Geography.

Answer Question 1 *or* Question 3, *not both*.

1. In what parts of Ireland are the counties of Mayo, Donegal, and Wicklow? Say what you know about each of them.

2. Which of the European capitals are also seaports? Draw little sketch-maps of the adjoining coasts, showing the position of each of them.

3. Describe the course of a traveller, coming down the Seine from Paris, then sailing along the coast to the mouth of the Rhine, and going up the Rhine as far as the Lake of Constance.

History.

1. Give the dates of the Coronation of Egbert, the Accession of Canute, and the Battle of Hastings.

2. Write down the list of English kings from Edward III. to Henry VII., with dates.

3. What sovereigns occupied the throne between 1660 and 1727? Tell their dates.

Penmanship.

Write, in large hand, as a specimen of copy-setting, the word *Sheriffdom*.

Write, in small hand, as a specimen of copy-setting, '*If son to Talbot, die at Talbot's foot.*'

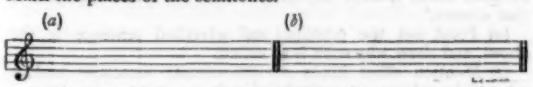
Composition.

Write from memory the substance of the passage read to you by the Inspector.

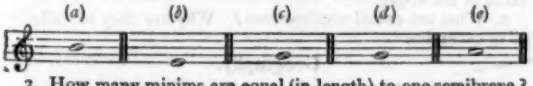
Music.

A quarter of an hour allowed for this paper.

1. Write in (*a*) the scale of F (*Fa*), and in (*b*) the scale of G (*Sol*), placing a sharp or a flat before each note requiring one. Mark the places of the semitones.



2. Place its third over (*a*), its fifth over (*b*), its fourth over (*c*), its second over (*d*), and its seventh over (*e*).



3. How many minims are equal (in length) to one semibreve?
" crotchets " " one minim?
" quavers " " a dotted minim?

ANSWERS.—FIRST YEAR.

Arithmetic.

MALES.

1. $\frac{£1\ 4\ 10\frac{1}{2}}{£3\ 19\ 8} = \frac{1195 \text{ farthings}}{3824 \text{ farthings}} = ·3125$. Ans.

2. $2\frac{1}{2}$ ac. = 12705 yds.
$7\frac{3}{4}$ ro. = 9196 "
$\frac{3}{4}$ po. = 11 "
$25\frac{1}{2}$ yds. = $25\frac{1}{2}$ "

$21937\frac{1}{4}$ sq. yds. at 5·25s. or 5s. 3d.

$21937\frac{1}{4}$

5s. = ¼ of £1	5484	5	0	value at 5s. per yd.	
3d. = $\frac{1}{20}$ of 5s.	274	4	3	"	" 3d. "
¼ of 5s. 3d. =	0	1	$3\frac{3}{4}$	"	of ¼ yd. at 5s. 3d.

£5758 10 $6\frac{3}{4}$ value of $21937\frac{1}{4}$ yds.

3.

	s.	d.
⅓ guinea =	4	8
£⅜ =	7	6
⅛ of 5s. =	0	$7\frac{1}{2}$
	12	$9\frac{1}{2}$
	11	9
	1	$0\frac{1}{2}$ = difference.

Now, reducing 1s. 0½d. to the fraction, vulgar and decimal, of £1, 5s., we have

$\frac{25 \text{ halfpence}}{25 \text{ shillings}} = \frac{25}{600}$ halfpence = vulgar fraction $\frac{1}{24}$
= decimal fraction ·0416.

4. This question can take the form ($3\frac{1}{4}$ of ⅜ — ·006), or

$$\left(\frac{26\times2}{7\times3} - \frac{1}{100}\right) = \frac{5200}{2100} - \frac{21}{2100} = \frac{5179}{2100}. \text{ Ans.}$$

5. $2·425 = \frac{2425}{1000} = \frac{97}{40}$.

5 cwt. 3 qrs. 16 lbs. = 660 lbs.;
∴ ⅓ of 660 lbs. = 1600½ lbs.,
and 1 ton = 2240 lbs.
So 2240 lbs. : 1600½ :: £5,

$\frac{1600\frac{1}{2}\times5}{2240} = £\frac{3201}{896} = £3$, 11s. 5·410714285½d. Ans.

FEMALES.

1. The creditors lose £2000 — £775, or £1225;
∴ if £1225 be lost on £2000,

£$\frac{1225}{2000}$ will be lost on £1, or 12s. 3d. Ans.

2. Since 3 men = 5 boys,
∴ 5 men + 5 boys = 8 men.
So 10 men : 8 men :: 15 days : 12 days. Ans.

3.
80 horses : 100 horses :: 9 days.
20 feet : 18 feet.
135 in. : 60 in.
378 in. : 168 in.

$\frac{100\times18\times60\times168\times9 \text{ days}}{80\times20\times135\times378} = 2$ days. Ans.

4.
1592448
174
6369792
11147136
1592448

	277085952	0	= value at £174.	
1s. 8d. = $\frac{1}{12}$ of £1	132704	0	=	" 1s. 8d.
2d. = $\frac{1}{120}$ " 1s. 8d.	13270	8	=	" 2d.
½d. = ¼ " 2d.	3317	12	=	" ½d.

£277235244 0 = value of whole.

Grammar.

1. *Thine*—pers. pron. 2d pers. fem. (?) sing. attrib. to *face.*
thine own (=*thy own*), pronom. poss. adj. qual. *smile.*
I—1st pers. pron. masc. (agr. with *Cowper*), sing. nom. subj. of *see.*
that—simple rel. pron. antecedent *smile*, neut. sing. nom. subj. of *solaced.*
me—1st pers. pron. masc. (agr. with *Cowper*), sing. obj. of *solaced.*
the same=demonstrative pron. agr. with *smile.*

2. The following words (by some considered prepositions) may be classed as adverbs followed by the dative case—that is, objective governed by *to* understood:—*Nigh, near, next, opposite, like, unlike.*

EXAMPLES.

He overtook me *nigh* (or *near*) the church.
You acted *like* (or *unlike*) yourself.
You stand *next* (or *opposite*) me.

3. The following are examples of relative pronouns limiting and defining the antecedent:—'That is the man *who spoke to me yesterday.*' 'The house *that* (or *which*) *he built still remains.*' The clauses in italics are adjective clauses, the one beginning with *who* defining *the man*, and that beginning with *that* or *which* defining *the house.*

In the following examples the relatives connect co-ordinate sentences:—'I met the guard *who* (= *and he*) told me there had been an accident.' 'At school I studied geometry, *which* (= *and it*) I found useful in after life.'

Geography.

1. *See same question answered in Candidates' Paper of this number.*

2. The following European capitals are also seaports:—*London, Dublin, Lisbon, Amsterdam, Copenhagen, Stockholm, St. Petersburg, Constantinople, Christiania.*

3. A traveller beginning at Paris and coming down the Seine would pass *Versailles*, a short distance from the river on the south bank, then *Rouen*, a cathedral city, and reach *Havre* at the mouth of the river. His course would now turn northwards through the *English Channel*, passing *Dieppe*, *Abbeville*, and *Boulogne* with its many English residents. In going through the *Straits of Dover*, he would have *Calais*, so long possessed by England, on his right, and *Dover* on his left. Now skirting the coast of *Belgium*, he would pass the seaport of *Ostend*, and reach the coast of Holland. Threading one of the many passages made by the islands at the mouth of the Rhine, he would enter one of the arms of its Delta, and traverse Holland, and on reaching the Prussian frontier, he would sail into the main stream past *Düsseldorf*, *Cologne*, famed for its perfume and its beautiful cathedral, *Bonn*, with a university, and *Coblentz*, opposite the famous *Ehrenbreitstein.* From Coblentz to *Mayence*, he would enjoy the most magnificent scenery on the river. From Mayence to *Mannheim*, the scenery would also be much admired, and on the next stage he would pass the town of *Spires*, noted for the Diet (1529), and *Strasburg*, with its wonderful clock and cathedral. On reaching *Basle* on the borders of Switzerland, he would find his course lay eastwards to *Schaffhausen* with the falls of the Rhine, and soon afterwards end his journey at *Lake Constance.*

History.

		A.D.
1.	Coronation of Egbert, as king of England,	827
	Accession of Canute,	1017
	Battle of Hastings,	1066
2.	Edward III. began to reign,	1327
	Richard II. " "	1377
	Henry IV. " "	1399
	Henry V. " "	1413
	Henry VI. " "	1422
	Edward IV. " "	1461
	Edward V. " "	1483
	Richard III. " "	1483
	Henry VII. " "	1485
3.	Charles II. " "	1660
	James II. " "	1685
	William III. and Mary II. began to reign	1689
	Anne	1702
	George I.	1714–27

Music.

3. How many minims are equal (in length) to one semibreve? (two).
How many crotchets are equal (in length) to one minim? (two).
How many quavers are equal (in length) to a dotted minim? (six).

SECOND YEAR.

Pupil Teachers at end of Second Year, *if apprenticed on, or after, 1st May* 1878; and Pupil Teachers at end of Third Year, if apprenticed before that date.

FIRST PAPER.

Two hours and a half allowed.

Arithmetic.

MALES.

1. What would be the simple interest, and amount, of £150, for 6 years and 10 months at 4 per cent.?

2. If £3256·75 produces at simple interest for 3·3 years £651·35, what is the rate of interest per cent. per annum?

3. A train starts from London at 9 A.M., and reaches Derby 130 miles distant at 12.15 P.M. A second train starts from London for Derby at 10.15 A.M., and travels 166 yds. per minute faster than the first. At what time will the latter train arrive? Answer to fraction of a *minute.*

4. The interest on a sum of money comes to £202·5 in 12 years at 4·5 per cent. simple interest; required the thousandth part of the principal.

5. If I buy a horse with $\frac{1}{8}$ of my money, and sell it again so as to gain 15 per cent. I now invest all but 15s. of what I got for the horse in 3 cows, one of which dying, I sell the remaining two for £96, thus losing 20 per cent. How much had I before buying the horse?

FEMALES.

1. Simplify the following:—

(*a*) $\frac{6}{12}+\frac{3}{5}+\frac{4}{8}+\frac{6}{30}$;

(*b*) $17\frac{2}{3}-\frac{4}{5}-7\frac{5}{6}$.

2. By how much does the sum of $\frac{51}{75}$, $\frac{131}{150}$, $\frac{24}{25}$, $\frac{1}{2}$, and $\frac{2}{3}$ fall short of 4?

3. Divide £2, 13s. 8d. among 7 men, 5 women, and 17 boys, giving each woman $\frac{2}{3}$ of each man's share, and each boy $\frac{2}{3}$ of each woman's share.

4. By selling an acre of land for 60 guineas, I gained $\frac{7}{13}$ of what it cost me; what did it cost me?

Grammar.

1. 'Before a novice can commence the study of any science, he *must* make himself *acquainted* with the terms *employed* in that science.'

(*a*) Point out the principal and adverbial sentence in the above, and show why each is so called.

(*b*) Mention other kinds of subordinate sentences besides adverbial, and give an example of each.

(*c*) Point out, and carefully parse, the participles and auxiliary verbs in the above.

2. What are causal conjunctions? Why are they so called? Give examples.

Geography.

1. Describe the course of a traveller, coming down the Seine from Paris, then sailing along the coast to the mouth of the Rhine, and going up the Rhine as far as the Lake of Constance.

2. Give notes of a lesson on Australia under these heads :—
(*a*) Position, shape, size.
(*b*) British settlements and chief towns.
(*c*) History of these settlements, with dates.
(*d*) Reason why they are all on the coast.
(*e*) Climate and productions.
Illustrate by a map, and refer to the map at each point of your lesson.
N.B.—No Introduction.

SECOND PAPER.

One hour allowed for Females, two and a half for Males.

History.

1. Upon the death of Edward the Confessor, who was the next heir to the crown? What other claimants were there? Discuss their respective claims.
2. How did Henry I. come to the throne? Give the name and descent of his Queen.
3. Who was Henry the Fifth's Queen? What second marriage did she make, and what line of sovereigns descended from it?

Penmanship.

Write, in large hand, as a specimen of copy-setting, the word *Sheriffdom*.
Write, in small hand, as a specimen of copy-setting, '*If son to Talbot, die at Talbot's foot.*'

Composition.

Write full notes of a lesson on the *Sun*.

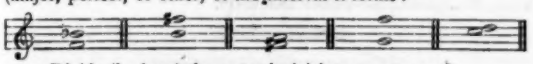
Euclid.

[All generally-understood abbreviations for *words* may be used, but no symbols of *operation* such as —, +, × are admissible.]
1. If two angles of a triangle be equal to each other, the sides also which subtend, or are opposite to the equal angles, shall be equal to one another.
What is a corollary? Give the corollary to this proposition.
2. If from the ends of a side of a triangle there be drawn two straight lines to a point within the triangle, these shall be less than the other two sides of the triangle, but shall contain a greater angle.
What is the *construction* in this proposition?

Music.

A quarter of an hour allowed for this paper.

1. Write, under each of the following, the name and quality (major, perfect, or other) of the interval it forms :—



2. Divide (by bars) the notes in (*a*) into measures of common time; those in (*b*) into measures of triple.

3. Write in (*a*) the signature of G (*Sol*), in (*b*) that of F (*Fa*), in (*c*) that of D (*Re*), and in (*d*) that of B♭ (*Se*).

ANSWERS.—SECOND YEAR.

Arithmetic.

MALES.

1. Interest of £150 for 6 yrs. 10 mos. at 4 p. c.

$$= \frac{£150 \times 6\frac{5}{6} \times 4}{100} = £41. \text{ Interest.}$$

$$\therefore £150 + 41 = £191. \text{ Amount.}$$

2. £3256·75 : £100 :: £651·35.
$3\frac{1}{2}$ yrs. : 1 yr.

$$\frac{£651{\cdot}35 \times 100 \times 3}{£3256{\cdot}75 \times 10} = £\frac{195405}{32567{\cdot}5} = £6 \text{ p. c. Ans.}$$

3. First train goes 130 miles in 3 hours 15 minutes,
" 228800 yards in 195 minutes,
" $\frac{228800}{195}$ yards in 1 minute,

∴ second train goes $1173\frac{5}{39}$ yds. + 166 yds. or $1339\frac{5}{39}$ yds. per min.
and ∴ $1339\frac{5}{39}$ yards : 228800 yards :: 1 minute.

$$\frac{686400 \times 1}{4018} = 170\frac{1670}{2009} \text{ minutes} = 2 \text{ hours } 50\frac{1670}{2009}.$$

The second train will therefore reach Derby at $5\frac{1670}{2009}$ min. past 1.

4. £4·5 : £202·5 :: £100.
12 yrs. : 1 yr.

$$\frac{£100 \times 202{\cdot}5}{4{\cdot}5 \times 12} = £375.$$

1000th part of £375 = £·375 = 7s. 6d. Ans.

5. By selling the two cows for £96, he lost 20 p. c.
∴ to find prime cost of the three, state thus :—
As 80 : 96 :: £100 : £120.

$$\frac{96 \times 100}{80} = £120;$$

∴ £120, 15s. = selling price of the horse.
To find buying price of the horse, state :—
As £115 : £120, 15s. :: £100 : prime cost of horse.

$$\frac{£120,\ 15s. \times 100}{115} = £105.$$

And £105 = $\frac{7}{8}$ of his original money,
or £105 × $\frac{8}{7}$ = £189. Ans.

FEMALES.

1. (*a*) $\frac{6}{12} + \frac{3}{5} + \frac{4}{8} + \frac{6}{30} = \frac{1}{2} + \frac{3}{5} + \frac{1}{2} + \frac{1}{5} = 1\frac{4}{5}$. Ans.

(*b*) $\left(17\frac{2}{3} - \frac{4}{5} - 7\frac{5}{6}\right) = \left(17\frac{20}{30} - \frac{24}{30} - 7\frac{25}{30}\right)$

$$= \left(16\frac{26}{30} - 7\frac{25}{30}\right) = 9\frac{1}{30}. \text{ Ans.}$$

2. The question may be written thus :—

$$4 - \left(\frac{51}{75} + \frac{131}{150} + \frac{24}{25} + \frac{1}{2} + \frac{2}{3}\right)$$

$$= 4 - \left(\frac{102 + 131 + 144 + 75 + 100}{150}\right)$$

$$= 4 - \frac{552}{150} = 4 - 3\frac{17}{25} = \frac{8}{25}. \text{ Ans.}$$

3. If a man gets 1 share, 7 men get 7 shares.
Then a woman " $\frac{3}{8}$ " 5 women " $3\frac{1}{8}$ "
And a boy " $\frac{1}{8}$ " 17 boys " $7\frac{1}{8}$ "

$17\frac{5}{8}$ shares altogether;

∴ every man gets $\frac{£2,\ 13s.\ 8d.}{17\frac{5}{8}} = \frac{644d. \times 9}{161} = 3s.$ Ans.

Every woman gets $\frac{3}{8}$ of 3s., or 2s. Ans.
Every boy gets $\frac{1}{8}$ of 2s., or 1s. 4d. Ans.

4. Here the selling price of the acre is $\frac{20}{13}$ of the prime cost;

∴ the prime cost = 60 guineas × $\frac{13}{20}$, or 39 guineas. Ans.

Grammar.

1. (*a*) '*He must make himself acquainted with the terms employed in that science*' is the principal sentence, because it contains the principal predicate or main proposition; and '*before a novice can commence the study of any science*' is the adverbial sentence, modifying the principal predicate like a simple adverb of *time*.
(*b*) The other kinds of *subordinate sentences* are :—*noun sentences*, which stand in the place of the *noun*, as, He answered, '*I know not the man*;' *adjective sentences*, which do the work of the *adjective*, as, The boy *that neglected his work* was punished.
(*c*) *Acquainted with*—complete participle, belonging to *himself*, from the compound verb to *acquaint with*.
employed—complete part. belonging to *terms*, from the trans. verb *to employ*.
must—verb, auxiliary, ind. mood, pres. tense (defect. in past), 3d pers. sing. agr. with *he*.
can—verb, auxiliary, ind. pres. (past tense *could*), 3d pers. sing. agr. with *novice*.

(*d*) *Because, therefore, for, since, whereas, seeing that, in order that, that, lest,* are called *causal conjunctions,* because they denote a cause or reason.

Examples.—He will succeed *because* he is in earnest. Do as you are told, *for* much depends upon it. *Since* you desire it, I will look into the matter. *As* we are at leisure, let us see all we can.

Geography.

1. *See same question answered under 'First Year' in this number of Magazine.*

2. NOTES OF LESSON ON AUSTRALIA.

(*a*) *Position.*—Between 10° 40′ and 39° 12′ S. lat., and between 113° and 153° 39′ E. long. *Shape.*—Trapezoidal or of an irregular onion form. *Size.*—2500 miles from E. to W., 1970 miles from N. to S., area about 3,000,000 square miles, or ¼ less than Europe.

(*b*) British settlements and chief towns :—

New South Wales, .	Sydney, Newcastle, Bathurst.
Victoria, . . .	Melbourne, Geelong, Ballarat.
S. Australia, . .	Adelaide, Kooringa.
W. Australia, . .	Perth, Freemantle.
Queensland, . .	Brisbane, Ipswich, Rockhampton.

(*c*) *New South Wales*—so named by Cook—founded 1788—a penal settlement at first—ceased to be such 1840—new life given to colony after discovery of gold 1851. *Victoria*—settled 1835—first called Australia Felix—colonists came from Tasmania—discovery of gold caused a great influx of adventurers—soon became the foremost of Australian colonies. *S. Australia*—proclaimed a colony 1839—suffered much from over-speculation—assisted by Home Government—discovery of copper mines at Burra-Burra hastened its prosperity. *W. Australia*—settled 1829—called first Swan River Settlement—from various causes has not been so prosperous as the other colonies. *Queensland*—proclaimed a colony 1859—formerly part of New South Wales, and called Moreton Bay Settlement.

(*d*) The mountain ranges of Australia are all on or near the coast, and this fact combined with the impassable character of these chains, and the uninviting nature of the interior, caused the settlements to be founded along the seaboard, where there are many rivers and general fertility.

(*e*) Its seasons the reverse of ours—being nearer the equator than Great Britain, its temperature is much higher—monsoons blow in the northern half—westerly winds prevail in south—speaking generally, the settled districts are dry and healthy—in New South Wales, Victoria, and S. Australia, these three peculiarities may be noted : (1) *long droughts,* very destructive ; (2) hot *winds,* blowing from the interior ; (3) sudden transition from heat to cold. *Productions.*—Gold, copper, wool, tallow—land better suited for pasture than tillage—vegetation goes on all the year, and is peculiar, consisting chiefly of gum trees, acacias, and heaths—food plants of Europe have been introduced—native animals nearly all pouched—*e.g.* Kangaroo—remarkable birds are lyre-bird, emu, and black swan.

History.

1. On the death of Edward the Confessor, three claimants for the throne arose, namely :—(1) Edgar Atheling, the grandson of Edmund Ironside, who by right of hereditary succession was the next heir to the crown. (2) Harold II., who was chosen by the Witan on account of his great influence in the kingdom ; and (3) William, Duke of Normandy, who was said to have got the promise of the throne on the occasion of his paying a visit to Edward. The latter is said to have left a will, naming William his heir.

2. Henry I., on hearing of the death of Rufus, seized the royal treasures, and being supported by the most powerful of the barons, got himself proclaimed king. His elder brother Robert was absent on a crusade, and though he returned to claim his rights, yet he could not make head against the usurper. Henry married Matilda, daughter of Malcolm, king of Scotland, and Margaret, the daughter of Edward, son of Edmund Ironside. Thus Henry's marriage with Matilda united the Saxon and Norman lines.

3. Henry V. married Catharine, daughter of the king of France. After Henry's death, she married Owen Tudor, a Welsh gentleman, and from this marriage sprang the Tudor line of sovereigns, of which Henry VII. was the first.

Composition.

NOTES OF A LESSON ON THE SUN.

1. *What is the sun?*—Centre of the solar system—solar system means the whole body of stars and planets of which our earth is one—one boy may be placed to represent the sun, and several other boys at various distances made to walk in circles round him—appearance of the sun, bright, luminous—the eye cannot look on him at his midday splendour. *Size.*—Said to be a globe more than a million times greater than our earth.

Distance from the earth.—About 95 millions of miles.

Effect on the earth.—The main source of heat which the earth possesses—the source of all the light—the support of all the animal and vegetable life in the world—the heat of the sun acting unequally the cause of the winds—heating of soil produces evaporation from watery surfaces, and cooling of vapours causes rain—the tides also depend on the attractive force of the sun as well as of the moon.

Eclipses of the sun—caused by moon coming between earth and sun—some reference may now be made to the causes of day and night, the seasons, and zones, 'rising and setting.'

Euclid.

1. Prop. 6, Bk. 1.

A corollary is a conclusion easily derived from the demonstration of a proposition. The conclusion which we may arrive at from this exposition of the 6th prop. is that equiangular triangles are also equilateral.

2. Prop. 21, Bk. 1.

The construction in this proposition is the producing of one line to meet the side of the triangle.

Music.

THIRD YEAR.

Pupil Teachers at end of Third Year, *if apprenticed on, or after,* **1st *May* 1878 ; and Pupil Teachers at end of Fourth Year, if apprenticed before that date.**

FIRST PAPER.

Three hours and a half allowed.

Arithmetic.

MALES.

1. On what sum will the simple interest amount to £168·778125 in 5 years at 4·5 per cent. ?

2. I buy 100 qrs. of wheat, and sell it again so as to gain 15 per cent. With the money received for the wheat I buy some hay, and sell it for £259, 8s. 9½d., thereby losing 6 per cent. ; what did I give for the wheat?

3. If 3 per cent. more be gained by selling a horse for £83, 5s. 0d. than by selling it for £81, which was the original price of the horse?

4. If 17½ gals. of spirits worth 12s. a gal. are put into a vat with 25 gals. of spirits worth 15s. a gal., and 30 gals. worth 18s. a gal., how much water should be added to make the resulting mixture worth 12s. 6d. a gallon?

5. A corn merchant's prices are 25 per cent. above cost price. If he allows a customer 12 per cent. on the bill which he sends in to him, what profit does the corn merchant realize?

FEMALES.

1. Simplify the expressions—

(*a*) $5 - 3\cdot22 + 2\cdot333 - 1\cdot4444$.

(*b*) $\frac{2\cdot004}{\cdot167} \times \frac{3\cdot375}{4}$.

2. Find the value of ·5 of a shilling + ·7 of a crown + ·125 of a pound.

3. The price of ·0625 lbs. of coffee being ·4583s., what is the cost of ·075 of a ton?

Grammar.

1. If enlargements are words and phrases attached to the nouns in a sentence, and extensions words or phrases attached to the verbs or predicates, assign all the enlargements and extensions which occur in the following to their proper classes :—

(*a*) 'The harp, his sole remaining joy,
Was carried by an orphan boy.'

(*b*) 'Ocean and earth, the solid frame of earth
And ocean's liquid mass, in gladness lay
Beneath him.'

(*c*) 'The sheen of their spears was like stars on the sea,
When the blue wave rolls nightly on deep Galilee.'

2. Parse any participles, or verbs in the infinitive mood, which occur in the following, and give the meaning of the passage in simple words of your own :—

'Blest be the art that can immortalize
The art that baffles time's tyrannic claim
To quench it.'

3. With what Latin preposition are the words *support*, *suffice*, *effect*, *destroy*, compounded? Give the meaning of the preposition in each case.

Geography.

1. Give notes of a lesson on Australia, under these heads :—

(*a*) Position, shape, size ;
(*b*) British settlements and chief towns ;
(*c*) History of the settlements, with dates ;
(*d*) Reason why they are all on the coast ;
(*e*) Climate and productions.

Illustrate by a map, and refer to the map at each point of the lesson.

N.B.—No Introduction.

2. Describe a journey from the Victoria Nyanza down the Nile, and then by land to Jerusalem, the Sea of Galilee, Mount Lebanon, and the town of Acre.

SECOND PAPER.

One hour allowed for Females, two and a half for Males.

History.

1. How was Henry VII. related to Edward III.? Do you think that this relationship gave him a right to the throne?

2. Who was Oliver Cromwell? Sketch his career and character.

3. Mention some leading statesmen of the time of George III., and describe the general policy of one of them. What would you say of the king's power in that reign?

Penmanship.

Write, in large hand, as a specimen of copy-setting, the word *Sheriffdom*.

Write, in small hand, as a specimen of copy-setting, '*If son to Talbot, die at Talbot's foot.*'

Composition.

Write from memory the substance of the passage read to you by the Inspector.

Euclid.

[All generally-understood abbreviations for *words* may be used, but no symbols of *operations*, such as $-$, $+$, $\times$, are admissible.]

1. The opposite sides and angles of a parallelogram are equal to one another, and the diameter bisects it, that is, divides it into two equal parts.

Two parallel lines cut a series of parallel lines ; show that the parts of the latter intercepted by the former have their middle points in the same straight line.

2. To describe a parallelogram equal to a given rectilineal figure, and having an angle equal to a given rectilineal angle.

What is the *construction* in this proposition?

Algebra.

1. Divide 1 by $1-x+x^2$ to four terms.

2. Simplify :—

(1) $\frac{3a-4b}{6}+\frac{2b-5a}{9}-\frac{5a-6b}{12}$.

(2) $\frac{a^2}{(a-b)(a-c)}+\frac{b^2}{(b-a)(b-c)}+\frac{c^2}{(c-a)(c-b)}$.

3. Solve the equations :—

(1) $\frac{1}{3}(x+2)+\frac{1}{4}(x-3)-\frac{1}{5}x=\frac{1}{12}$.

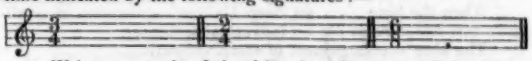
(2) $9-\frac{2x-3}{2x-2}=\frac{5x+3}{x-1}$.

Music.

A quarter of an hour allowed for this paper.

1. Complete the following (by inserting the necessary sharps or flats) as a descending and ascending diatonic minor scale of D (*Re*). Mark the places of the semitones :—

2. Write a measure, of rests only, in each of the kinds of time indicated by the following signatures :—



3. Write over each of the following the name of the major scale, and under each that of the minor scale of which it is the signature :—

ANSWERS.—THIRD YEAR.

Arithmetic.

MALES.

1. £4·5 : £168·778125 :: £100.
5 years : 1 year.

$$£\frac{100\times 168\cdot 778125}{4\cdot 5\times 5}=£\frac{16877\cdot 8125}{22\cdot 5}$$

$$=£750\cdot 125=£750,\ 2s.\ 6d.\ \text{Ans.}$$

2. To find the cost of the hay, state thus :—

94 : 100 :: £259, 8s. 9·6d.

$$=\frac{62265\cdot 6d.\times 100}{94}=6624od.=£276.$$

To find the prime cost of wheat which was sold for £276, state thus :—

115 : 100 :: £276.

$$\frac{£276\times 100}{115}=£240,\ \text{price of the 100 qrs.}$$

3. A difference of £2, 5s. is equal to 3 p. c. of original price ;
∴ £3 : £2, 5s. :: £100 : £75. Ans.

4.

		s.
17½ galls.	at 12s. =	210
25	,, 15s. =	375
30	,, 18s. =	540
72½ galls.		1125s.

Now galls. required × 12s. 6d. = 1125s.
∴ ,, = 1125 ÷ 12½ = 90.
Then the water to be added = 90 − 72½ = 17½ galls. Ans.

5. If £100 represents cost price, then £125 represents the corn merchant's price.

$$\frac{12}{100}\ \text{of}\ £125=£15,$$

or the corn merchant gets £125 − 15, or £110 = a clear profit of 10 per cent.

FEMALES.

1. (*a*) (5 − 3·22 = 1·78); (1·78 + 2·333 = 4·113); (4·113 − 1·4444) = 2·6686 Ans.

(*b*) $\frac{2\cdot 004}{\cdot 167}\times\frac{3\cdot 375}{4}=12\times\cdot 84375=10\cdot 125.$

2.

		s.	d.
·5	of 1s. =	0	6
·7	of 5s. =	3	6
·125	of £1 =	2	6
		6	6 Ans.

3. ·0625 lbs. : ·075 ton :: ·4583s.
or ·0625 lbs. : 168 lbs. :: 5·5d.
$$= \frac{5{\cdot}5\text{d.} \times 168}{{\cdot}0625} = 14784\text{d.} = £61,\ 12\text{s.}$$

Grammar.

1. (*a*) 'His sole remaining joy'—an enlargement of *harp* (noun phrase).
'*By an orphan boy*'—extension of *was carried* (instrument).

(*b*) 'The solid frame of earth'—enlargement of *earth* (noun phrase).
'Ocean's liquid mass'—enlargement of *ocean* (noun phrase).
'In gladness'—extension of *lay* (manner).
'Beneath him'—extension of *lay* (place).

(*c*) 'Of their spears'—enlargement of *sheen* (adjective phrase).
'When the blue . . . on deep Galilee'—extension of predicate *was like stars on the sea* (adverbial sentence).
'The blue'—enlargement of *waves* (adjective).
'Nightly'—extension of *rolls* (time).
'On deep Galilee'—extension of *rolls* (place).

2. *Blest*—complete part. qual. *art.*
be—pres. inf. of incompl. verb *am, was, been.* The full expression = *Let the art (to) be blest.*
to quench—pres. inf. of reg. verb *quench.*
The lines may be rendered thus :—
All honour to the skill which is capable of preventing the works effected by genius from being destroyed by the changes of time.

3. Support is compounded with *sub*, meaning *under.*

Suf-fice	,,	,,	,,	,,	,,
Ef-fect	,,	,,	*ex*	,,	*out of.*
De-stroy	,,	,,	*de*	,,	*down* or *from.*

Geography.

1. *See same question answered under Second Year in this number of Magazine.*

2. In following the course of the Nile from its chief reservoir, the Victoria Nyanza (discovered by Sir Samuel Baker and Captain Speke), to its delta, we have a journey of 3300 miles. After leaving the Victoria Nyanza, the river passes through the Albert Nyanza, traverses a level region to Gondokoro, then flows with many windings first north-west, then north-east, receives its first great branch, the Bahr-el-gazal, from the west, takes a turn to the east, then south, and receives the Sobat from the east. It then strikes north to Khartoum, where it is joined by the Bahr-el-Azrek, long supposed to be the main river, from Abyssinia. It continues north past the ruins of Meroe, the first cataract, and Shendy. The Atbara, the third great tributary, now joins it, under the name of the Takazze, and winding through Nubia, past Berber, New Dongola, Ipsambool, and Derr, it enters Egypt at Assouan, and flows the whole length of the country, which it fertilizes, passing ruins of Thebes, Kenneh, Siout, Ghizeh, to Cairo, where we will leave it to enter the Mediterranean by three main streams, distinguished respectively as the Alexandria, Rosetta, and Damietta mouths. Leaving the Nile, we cross Egypt to the canal through the Isthmus of Suez. When in this neighbourhood, it would be very interesting to follow as nearly as possible the route taken by the Israelites through the desert to Horeb, Sinai, and other noted spots, without taking so long on the journey. On reaching Jerusalem, we must pay a visit to Bethlehem, the Dead Sea, etc. On our journey north from Jerusalem, we could render the route very pleasant by searching for those places so famous in Bible times, Bethel, Jericho, Mount Gerizim, Shechem, Dothan, Mount Gilboa, Nain, Mount Tabor; and after a sail on the Sea of Galilee, a short journey north-east will take us to Mount Lebanon, with the well-known cedars. To the south-east lies Acre, on a considerable bay; here Sir Sydney Smith baffled Napoleon in his attempts to take the town.

History.

1. Henry VII. was related to Edward III. through his grandfather Owen Tudor, who was the son of Margaret, great-granddaughter of John of Gaunt, the third son of Edward III. His title to the throne was so defective that he himself hesitated whether to claim it by descent, by conquest, or by his marriage with Elizabeth, who represented the House of York.

2. Oliver Cromwell was the son of Robert Cromwell, and born at Huntingdon 1599. He was returned as member for his native town to the third Parliament of Charles I. 1628. He was again elected in 1640. He was associated with Hampden, Pym, and other popular leaders, and was one of the first to advocate resistance to the king's measures. In 1642 he received a captain's commission, and raised a troop of horse in his native county. So well were his soldiers disciplined, that after the battle of Marston Moor they got the name of Cromwell's Ironsides. At Naseby, Cromwell commanded the right wing, and Ireton, his son-in-law, the left. Charles was totally defeated in this battle, and ultimately gave himself up to the Scots at Newark. In 1649, when it was settled at his trial that the king should be executed, Cromwell is said to have reluctantly assented; but when convinced of the necessity of Charles's death, he seems to have had no hesitation in carrying the decision of the court into effect. After the execution, Cromwell became a principal member of the Council of State. He quelled a mutiny in the army, crossed over and conquered Ireland, returned to make war on Prince Charles and the Scots, whom he conquered at Dunbar and Worcester. In 1653 he expelled the Long Parliament, and was elected Protector of the Commonwealth, which office he held till his death in 1658.

Cromwell has now come to be regarded as one of England's greatest rulers. He was a man of most marvellous genius, who after the age of forty became an invincible general and a wise statesman. He was a zealous patriot, and an enthusiast in religion. To him are we indebted for the great lesson of religious toleration.

3. The leading statesmen of the time of George III. were :—*Washington* (in America), *William Pitt* (the Tory), and *Fox, Burke,* and *Sheridan,* great Whig orators. The general policy of Pitt was one of active reform, and he faced the most difficult problems in finance, politics, and religion, from which Walpole had shrunk. By a reduction of the custom duties, he checked smuggling by making it unprofitable. Though he failed in Parliamentary reform, yet this was counterbalanced by the success of his financial policy, which introduced a saving in every department of the public service and the reduction of taxation. His policy towards France was to bring the French War to an end by English mediation, and to leave the French to arrange their own internal affairs. He was a Peace Minister, and was forced into a war policy against his will by the panic and enthusiasm of the people.

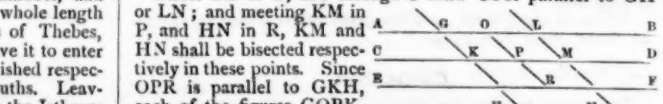
The king's power in the reign of George III. was a monarchy limited by the Commons, who did not represent the democracy fairly until after the Reform Bill of 1832.

Euclid.

1. Prop. 34, Book I.

Rider.—Let the two parallels GH, LN cut a series of parallels AB, CD, EF respectively in G, K, H, L, M, N. Then the middle points of GL, KM, HN shall lie in the same straight line.

Bisect GL in O, and through O draw OPR parallel to GH or LN; and meeting KM in P, and HN in R, KM and HN shall be bisected respectively in these points. Since OPR is parallel to GKH, each of the figures GOPK, KPRH is a parallelogram, and its opposite sides are equal; therefore GO is equal to KP, and KP is equal to HR. But GO is the half of GL; therefore KP is half of KM, and HR half of HN, for GL=KM=HN.—Q.E.D.



2. Prop. 42, Book I.

Algebra.

1. $1-x+x^2 \;\big)\; 1 \;\big(\; 1+x-x^3-x^4$

$1-x+x^2$
$x-x^2$
$x-x^2+x^3$
$-x^3$
$-x^3+x^4-x^5$
$-x^4+x^5$
$-x^4+x^5-x^6$

2. (1) L. C. M. of denominators = 36;

$$\therefore \text{the expression} = \frac{18a-24b+8b-20a-15a+18b}{36}$$
$$= \frac{2b-17a}{36}.$$

(2) Changing the signs of the numerators and denominators to arrange terms, the expression

$$= \frac{a^2}{(a-b)(a-c)} - \frac{b^2}{(b-c)(a-b)} + \frac{c^2}{(a-c)(b-c)}.$$

L. C. denominators $= (a-b)(a-c)(b-c)$,
or $= a^2b - a^2c - b^2a + b^2c + c^2a - c^2b$;

therefore the expression becomes

$$\frac{a^2(b-c)}{(a-b)(a-c)(b-c)} - \frac{b^2(a-c)}{(a-b)(a-c)(b-c)} + \frac{c^2(a-b)}{(a-c)(b-c)(a-b)}$$
$$= \frac{a^2b - a^2c - b^2a + b^2c + c^2a - c^2b}{a^2b - a^2c - b^2a + b^2c + c^2a - c^2b}$$
$$= 1.$$

3. (1) L. C. M. of denominators $= 24$; therefore the expression becomes

$$3x + 6 + 4x - 12 - 6x = 19,$$
$$3x + 4x - 6x = 19 - 6 + 12,$$
$$x = 25.$$

(2) L. C. M. of denominators $= 2(x-1)$; therefore the expression becomes

$$9(2x-2) - 2x + 3 = 10x + 6,$$
$$18x - 18 - 2x + 3 = 10x + 6,$$
$$18x - 2x - 10x = 6 - 3 + 18,$$
$$6x = 21,$$
$$x = 3\tfrac{1}{2}.$$

Music.

1.

2.

3.

FOURTH YEAR.

Pupil Teachers at end of Fourth Year, *if apprenticed on, or after, 1st May* 1878; **and Pupil Teachers at end of Fifth Year, if apprenticed before that date.**

FIRST PAPER.

Three hours and a half allowed.

Arithmetic.

MALES.

1. Find the cost of papering a room 12 feet high, 18 feet long, and 15 feet wide, at 4s. a sq. yard (labour charged extra 2½d. per sq. yard), and of colouring the ceiling at 8½d. per square yard.

2. Find the difference between 20·25 guineas, and the present worth of a bill for £21, 10s. 0d. due in 3 months, reckoning interest at 4 per cent. per annum.

3. A sum is laid out in the 4 per cents., standing at 102½, and one half-year's dividend received upon it; the stock is then sold at 105¾, and the whole increase of capital, including the half-year's interest, is £253, 10s. 0d. Find the original sum.

4. A and B run a mile race; at first, A runs 11 yds. to B's 10, but after A has run ¼ a mile he gets tired, and runs 9 yards in the time in which he at first ran 11, B running at his original rate. Which will win, and by how much?

5. From $\frac{1}{24}$ of $\sqrt[3]{5{\cdot}919918129}$, take $\frac{1}{101}$ of $\sqrt[3]{01{\cdot}770404177}$.

FEMALES.

1. The sum of £463, 16s. is to be raised in a parish, the assessment of which is £6184; what is the rate in the pound?

2. If 858 men in 6 months consume 234 quarters of wheat, how many quarters will be required for the consumption of 979 men for 3½ months?

3. Find the amount of £417, 7s. 9d. for 1 year 10 months at 4½ per cent. per annum.

4. A man owes three creditors, A, B, and C, respectively, £175, £210, and £265; his property is worth £422, 10s.; what ought they each to receive?

Grammar.

1. 'He scarce had finished, when such murmur filled
Th' assembly, as when hollow rocks *retain*
The sound of *blustering* winds, which all night long
Had roused the sea, now with hoarse *cadence lull*
Seafaring men *o'er watched*.'

(*a*) Point out all the subordinate sentences in the above, and assign each to its proper class.

(*b*) Parse the words in italics, and give their meaning and derivation, if you know them.

2. The following words in our language are said to be of Latin-French origin (*i.e.*, they are Latin words that have come to us through the medium of the French). Show that this is so, and give examples of other words of the same kind:—*charm, clear, journal, siege, treason.*

3. How did words of the above character (French-Latin) find their way into our language?

Geography.

Answer Q. 1 *or* Q. 3, *not both.*

1. Give notes of a lesson to an advanced class on '*Trade Winds and Monsoons*,' and their effects on climate and navigation.

2. Draw a full map of the United States.

3. Describe, as fully as you can, *Peru, Bolivia,* and *Chili.*

SECOND PAPER.

One hour allowed for Females, two and a half for Males.

History.

1. Show how the English Crown passed from the House of Normandy to that of Anjou, and from the House of Stuart to that of Brunswick.

2. Who was the first English Sovereign proclaimed King of Ireland? What Irish title had been borne by his predecessors, and what was its meaning under the feudal system?

3. Who was John Wilkes? What constitutional principle was involved in the dispute about his seat for Middlesex?

Penmanship.

Write, in large hand, as a specimen of copy-setting, the word *Sheriffdom.*

Write, in small hand, as a specimen of copy-setting, '*If son of Talbot, die at Talbot's foot.*'

Composition.

Write an essay on '*The British Empire is one on which the sun never sets.*'

Euclid.

[All generally-understood abbreviations for *words* may be used, but not symbols of *operations*, such as —, +, ×.]

1. If the square described upon one of the sides of a triangle be equal to the squares described upon the other two sides of it; the angle contained by these two sides is a right angle.

2. If a straight line be divided into two equal, and also into two unequal parts, the squares on the two unequal parts are together double of the square on half the line, and of the square on the line between the points of section.

Divide a straight line into two parts, so that the sum of their squares may be the least possible.

Algebra.

1. How many minutes is it to four o'clock, if three-quarters of an hour ago it was twice as many minutes past two o'clock?

2. Find the sum and difference of

$$\left(\frac{x}{a} + \frac{a}{x}\right)\left(\frac{y}{b} + \frac{b}{y}\right) \text{ and } \left(\frac{x}{a} - \frac{a}{x}\right)\left(\frac{y}{b} - \frac{b}{y}\right).$$

3. Solve the equations :—

1. $33x^2 - 131x = 52.$

2. $\frac{2x-25}{3} - \frac{6-y}{7} = \frac{2(x-7)}{5}$

$$\frac{29-y}{8} - \frac{3x-1}{10} = \frac{4-y}{3}$$

Mensuration.

1. The area of a rectangular field contains 975744 square feet, and one of the sides is $3\frac{1}{2}$ times as long as the other. What is the length of each side?

2. The diameter of a circle is 476 links; find its area in acres, etc.

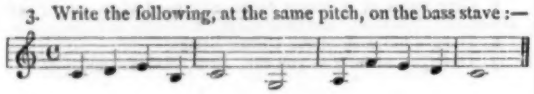
Music.

A quarter of an hour allowed for this paper.

1. Write the upper tetrachord of D (*Re*) minor in every form with which you are acquainted. Mark the places of the semitones, and augmented intervals.

2. Write under each of the following pairs of notes the name and quality (major, perfect, diminished, or other) of the interval it forms :—

3. Write the following, at the same pitch, on the bass stave :—



ANSWERS.—FOURTH YEAR.

Arithmetic.

MALES.

1. (1) Area of the side walls = (12 ft. × 18 ft.) × 2 = 432 sq. ft.
„ end „ = (15 ft. × 12 ft.) × 2 = 360 „
792 sq. ft.

	£	s.	d.
792 sq. ft. = 88 sq. yds. at 4s.	= 352s. = 17	12	0
88 „ at 2½d. = 220d. =	0	18	4

∴ cost of papering room = £18 10 4. Ans.

(2) Area of ceiling = 18 ft. × 15 ft. = 270 sq. ft. = 30 sq. yds.
30 sq. yds. at 8½d. = 255d. = £1, 1s. 3d. Ans.

2. Interest of £100 for 3 months at 4 p. c. per annum = £1.
Amount „ „ „ „ = £101 ;
∴ £101 : £21·5s. :: £100 : present worth.

$$\frac{£100 \times 21{\cdot}5}{101} = \frac{2150}{101} = £21 \; 5s. \; 8\tfrac{93}{101}d.$$

and 20·25 guineas = 21 5 3

therefore the difference = £0 0 $5\frac{93}{101}$. Ans.

3. Half-year's dividend on every £102½ = £2
Profit from sale of every „ = £2½

Total gain on „ = £4½

The question may now be stated thus :—If every £102½ of stock bring a gain of £4½, what amount of stock must be sold to have a profit of £253½?

$4\frac{1}{2} : 253\frac{1}{2} :: 102\frac{1}{2}$: stock sought,

$$\text{or } \frac{39}{8} : \frac{507}{2} :: £\frac{205}{2} : £\frac{8 \times 507 \times 205}{39 \times 2 \times 2}$$

$$= £\frac{2 \times 13 \times 205}{1} = £5330. \text{ Ans.}$$

4. When A has run ⅞ mile or 880 yards, B has run $\frac{19}{20}$ of 880 or 800 yards; A has therefore 880 yards, and B 960 yards still to run.

When B has finished his mile, A has only run $\frac{8}{10}$ of 960 or 864 yards, and of course has 16 yards to make up when B has finished, or B wins by 16 yards.

5. (*a*) Cube root (first method).

5·919918129 (1·809
$1^3 = 1$

4919
$3 \times (10)^2 = 300$
$3 \times 10 \times 8 = 240$
$8^2 = 64$
$604 \times 8 = 4832$

87918129
$3 \times (1800)^2 = 9720000$
$3 \times 1800 \times 9 = 58600$
$9^2 = 81$
$9778681 \times 9 = 87918129$

$\frac{1}{54}$ of 1·809 $= \frac{1{\cdot}809}{6 \times 9} = \frac{{\cdot}201}{6} = {\cdot}0335.$

(*b*) Cube root (second method).

61·770404177 (3·953
$3^2 = 27$

34770
$3^2 \times 300 = 2700$
$9{,}9 \times 9 = 891$
$3591 \times 9 = 32319$

2451404
$9^2 = 81$
$117{,}5 \times 5 = 5875$
$462175 \times 5 = 2310875$

140529177
$5^2 = 25$
$11853 \times 3 = 35559$
$46843059 \times 3 = 140529177$

$\frac{1}{181}$ of 3·953 = ·01966̇
·0335

Sum of (*a*) and (*b*) = ·05316̇

$$= \frac{5316 - 0531}{90000} = \frac{4785}{90000} = \frac{319}{6000}. \text{ Ans.}$$

FEMALES.

1. The question is this :—If £463, 16s. is raised from £6184, how much can be raised from £1?
∴ the statement is £6184 : £1 :: £463, 16s.

	£	s.	
6184)	463	16 (	1s. 6d. Ans.
	20		
	9276		
	6184		
	3092		
	12		
	37104		
	37104		

2. 858 men : 979 men :: 234 qrs. : x,
6 months : 3½ months :: x : qrs. required.

$$\frac{234 \text{ qrs.} \times 979 \times 7}{858 \times 12} = \frac{39 \times 89 \times 7}{78 \times 2} = \frac{89 \times 7}{2 \times 2} = \frac{623}{4}$$

$= 155\frac{3}{4}$ qrs. Ans.

3. $\frac{£417, 7s. 9d. \times 1\frac{1}{2} \times 4\frac{2}{3}}{100} = \frac{£417, 7s. 9d. \times 11 \times 35}{100 \times 6 \times 8}$

$= \frac{£417, 7s. 9d. \times 77}{960}$.

	£	s.	d.
	417	7	9
			11
	4591	5	3
			7
12)	32138	16	9
960 { 10)	2678	4	$8\frac{3}{4}$
8)	267	16	$5\frac{33}{40}$
	33	9	$6\frac{27}{40}$
Adding the principal,	417	7	9
Amount =	£450	17	$3\frac{27}{40}$

4.

	£
Since A's is	175
B's ,,	210
C's ,,	265
Total,	£650

650 : 175 :: £422, 10s. : £113, 15s. A's share.
650 : 210 :: £422, 10s. : £136, 10s. B's ,,
650 : 265 :: £422, 10s. : £172, 5s. C's ,,

Grammar.

1. (*a*) The subordinate sentences are :—
(1) 'When such murmur . . . assembly.' Adverbial of *time* modifying 'principal sentence.'
(2) 'As when hollow . . . winds.' Adverbial of *manner*, modifying (1).
(3) 'Which all night . . . sea.' Adjective qualifying *winds*.
(4) 'Now with hoarse . . . o'er-watched.' Adjective, *same as* (3).

Note.—(2) may be analysed thus :
(*a*) 'As (fills the hollow rocks),' *adj.* to *murmur*.
(*b*) 'When hollow, etc.,' adverbial of *manner* to (*a*).

(*b*) PARSING.

retain—verb, transitive, weak conj. indic. mood, pres. tense, plur. 3d pers. agr. with subj. *rocks*.
blustering—verbal adjective, qualifying *winds*.
cadence—noun, abstract, neut. sing. obj. governed by *with*.
lull—verb, trans. weak conj. indic. mood, pres. tense, plur. 3d pers. subject (*which*).
o'er-watched—adjective qualifying *men*.
(*O'er* has an adverbial force, but the two words are properly parsed as one.)

DERIVATION.

retain—Latin *re*, again, *teneo*, I hold.
blustering—Sax. *blæsan*, to blow.
cadence—Latin (*cado*) *cadens*, falling.
lull—German, *lullen* or *lollen*, to sing.
o'er—Sax. *ofer*, *-er* comparative ending.
watched—Sax. from *wake*. *k* is modified.

2. *English.*	*French.*	*Latin.*
charm	charme	carmen
clear	clair	clarus
journal	journal	diurnus
siege	siége	sedere, sessio
treason	trahison	traditio
chief	chef	caput
poor	pauvre	pauper
nourish	nourir	nutrire

3. French-Latin words found their way into our language partly during the Norman-French rule after the Conquest, but mostly through writers, such as Chaucer, introducing French words of Latin origin into their works. To the court and times of Charles II. we owe a great many French terms.

Geography.

1. NOTES OF A LESSON ON TRADE WINDS AND MONSOONS.

Causes.—Trade winds are cold currents of air flowing from polar regions to replace warmer air constantly ascending from tropics, and finding its way among upper strata of atmosphere back to regions in which cold currents take their rise.

Direction.—Nearly due west (but slightly south or north, according as it is a north-east or south-east trade wind), caused by the rotation of the earth on its axis from west to east.

Where they blow.—In the Atlantic and Pacific all the year round in a belt 30° on each side of equator. In Indian Ocean they blow from east to west from November to March, but from April to October they blow from the south-west. These are called in India the *monsoons*.

Benefits to Commerce.—Before the invention of steamers, great helps to navigation. Got their name from their assistance to trade. Every ship from Europe to West Indies, Brazils, India, or Peru, passed through the 'Trades,' and the seamen generally found them regular and steady to help them on their course. The same happened to assist those who sailed the Pacific between America and Asia.

Effect on climate.—These winds have the effect of giving the alternation of dry and wet seasons to the regions lying within their influence, the latter moderating the heat and fertilizing the soil.

In giving lesson, reference to be made to the Terrestrial Globe.

3. *Peru* and *Bolivia*, traversed throughout their whole length by two parallel ranges of the Andes, which divide the country into three physical regions—(1) The Coast region, extending from the coast of Pacific to base of the Andes, 60 miles in breadth; (2) Central region, consisting of a plateau; (3) Eastern region, consisting of immense plains covered with vast forests, extending up the mountain-sides.

Towns in *Peru.*—*Lima*; *Callao*, port of Lima; *Arequipa*; *Cuzco*, ancient capital of the Incas; *Pasco*, up in the Andes, most elevated city in the world.

In *Bolivia.*—*Chuquisaca*; *Potosi*, has richest silver mines in the world; *Cochabamba*, 'granary of Peru;' *La Paz*.

Climate.—Coast region arid, rainless, barren; Central, mild and salubrious; Eastern, hot and humid valleys, and table-land productive.

Productions.—Peruvian bark most important. Precious metals are chief source of wealth.

Animals include llama, used as a beast of burden, and alpaca, useful for its wool.

Chili consists of a long narrow strip between the Andes and the Pacific, formed chiefly of mountain slopes. The Andes attain their highest elevation here.

Towns.—*Santiago*, amid beautiful scenery; *Valparaiso*, 'Vale of Paradise;' *Concepcion*; *Valdivia*, a penal settlement; *Copiapo*.

Climate.—North, dry and barren; centre, very beautiful and fertile.

Productions similar to those of Peru, and include the potato, which is said to be indigenous to Chili.

History.

1. On the death of Henry I. his daughter Maud should have succeeded, but Stephen of Blois usurped the throne. A war ensued between the rival parties, but eventually an arrangement was come to, by which Stephen was to keep the crown, but on his death it was to pass to Henry Plantagenet, son of Maud and Geoffrey, Count of Anjou. With Stephen the crown left the Norman line.

2. Henry VIII. was the first English Sovereign proclaimed King of Ireland. Previous to this time, the English King was content with the title of Lord Suzerain. Under the Feudal system the vassal swore fealty to his superior by placing his hands within those of his master and declaring, 'I become liege man of yours for life and limb, and earthly regard, and I will keep faith and loyalty to you for life, God help me.'

3. John Wilkes, member of Parliament for Aylesbury in 1763, was arrested for libelling the Grenville ministry. He was a man of bad character, but witty and agreeable, and his persecution made him a popular hero. Some years later he became still more famous as the subject of a struggle between the House of Commons and the freeholders of Middlesex, who maintained their right to return him as their representative,

although, having been expelled from the House for another political libel, he was—so the Commons by a stretch of power had resolved—incapable of being elected into that Parliament. In this struggle the Commons endeavoured not only to limit at their own arbitrary discretion the free election of the constituency, but they transferred its rights to themselves by seating Luttrel as member, although Wilkes had defeated him by an immense majority.

Composition.

THE BRITISH EMPIRE IS ONE ON WHICH THE SUN NEVER SETS.

As the Colonies and Dependencies of Britain are scattered over the whole globe, and not confined to any particular quarter of its surface, the common assertion that 'the sun never sets on the British Dominions' is strictly true. By referring to a map of the world, it may be easily seen that the subject of this essay is not a poetical fancy. Seeing that the earth revolves on its axis once in every 24 hours, it must pass over 15° of longitude every hour. Therefore by the time that the sun has been four hours risen on England, he will be rising to all places under the longitude of 60° west, viz. our West Indian possessions. Four hours later, after having risen on all the other parts of British America, he will be making his appearance on British Columbia. Three hours after he will be rising in New Zealand or to all places under long. 180° west. Two hours later he will be rising in Australia, three hours later in Calcutta, in another hour on Bombay, in other two hours on Aden, in one hour more on Cape Colony and Natal, and two hours after he will be rising on Britain again.

Euclid.

1. Prop. 48, Book I.
2. Prop. 9, Book II.

Rider.—if a straight line be bisected, *the sum of the squares on the two halves is the least possible;* for if the line be cut in any other point, the line will be cut unequally; and by Prop. 9, Book II. the sum of the squares on the two unequal parts is double of the square on half the line, and of the square on the line between the points of section, or in other words, the sum of the squares on the parts of a line cut unequally is always greater than the sum of the squares on the halves of the line, by double the square on the part between the middle of the line and the other point.

Algebra.

1. Let x = number of minutes from 4 o'clock.
Then $2x$ = " " past 2 "
or $2x+x+45$ make up the 2 hours;
∴ the equation is $3x+45=120$ minutes,
$3x=120-45$,
$3x=75$,
$x=25$.

2. $\left(\frac{x^2+a^2}{ax}\right)\left(\frac{y^2+b^2}{by}\right)\pm\left(\frac{x^2-a^2}{ax}\right)\left(\frac{y^2-b^2}{by}\right)$

$=\frac{x^2y^2+a^2y^2+b^2x^2+a^2b^2}{abxy}\pm\frac{x^2y^2-a^2y^2-b^2x^2+a^2b^2}{abxy}$.

$\text{Sum}=\frac{2(x^2y^2+a^2b^2)}{abxy}$.

$\text{Difference}=\frac{2(a^2y^2+b^2x^2)}{abxy}$ or $-\frac{2(a^2y^2+b^2x^2)}{abxy}$ if 2d expression $\gtrless$ 1st.

3. (1) $x^2-\frac{131x}{33}=\frac{52}{33}$.

Completing square,

$$x^2-\frac{131x}{33}+\left(\frac{131}{66}\right)^2=\frac{6864+17161}{4356}=\frac{24025}{4356}.$$

Taking root,

$$x-\frac{131}{66}=\pm\frac{155}{66},$$

$$x=\frac{131}{66}\pm\frac{155}{66},$$

$$x=\frac{286}{66}\text{ and }-\frac{24}{66},$$

$$x=4\tfrac{1}{3}\text{ and }-\frac{4}{11}.$$

(2) (*a*) $\frac{2x-25}{3}-\frac{6-y}{7}=\frac{2(x-7)}{5}$.

L. C. M. of denominators $=5\times7\times3$.

$70x-875-90+15y=42x-294$,

$70x-42x+15y=875+90-294$,

$28x+15y=671$.

(*b*) Reducing to common denominators,

$870-30y-72x+24=320-80y$,

$-72x-30y+80y=320-24-870$,

$-72x+50y=-574$.

Dividing by -2,

$36x-25y=287$.

From (*a*) $140x+75y=3355$ (multiplying by 5).
" (*b*) $108x-75y=861$ (multiplying by 3).

Adding, $248x=4216$
$x=17$. Ans.

Substituting 17 for x in first equation,

$$\frac{34-25}{3}-\frac{6-y}{7}=\frac{34-14}{5},$$

$$3-\frac{6-y}{7}=4,$$

$$21-6+y=28,$$

$$y=28+6-21,$$

$$y=13.\text{ Ans.}$$

∴ $x=17$ and $y=13$.

Mensuration.

1. If x = one side in feet, then $\frac{3}{4}x$ = other,
or $\frac{3}{4}x\times x=\text{area}=975744$.
$7x^2=1951488$,
$x^2=278784$,
$x=\sqrt{278784}=528$ feet;
∴ the one side is 528 feet long,
the other " $528\times3\frac{1}{2}=1848$ feet.

2. Area $=476\times476\times{\cdot}7854$, or

476
476
2856
3332
1904
226576
·7854
906304
1132880
1812608
1586032

Area = 177952·7904 square links.

Reducing to acres, etc.:—
Dividing by 100,000 square links, which = 1 acre, we obtain

1·779528 acres nearly
4
3·118112 roods
40
4·72448 poles.

Area = 1 acre 3 roods 4·72 poles nearly.

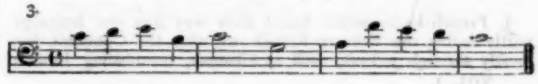
Music.

1.

2.

Diminished 4th. Diminished 7th. Augmented 6th. Augmented 2d.

3.



Publications Received.

Domestic Economy—
(1) Popular Lessons on Cookery. Griffith & Farran.

Drawing—
(1) Lewis's Perspective, Books 5 and 6. Walker & Co.

Examination Work—
(1) Pupil Teachers' Examination Papers for 1880. John Heywood.

French—
(1) Multum in Parvo French Verb Book. Simpkin & Co.

Geography—
(1) Statistical Atlas of England, Scotland, and Ireland. Part II. Educational. Edited by G. Phillips Bevan. W. & A. K. Johnston.
(2) Spence's Civil Service Geography. Crosby Lockwood & Co.
(3) Williams' Geography of the Oceans. Philip & Son.
(4) Types of Nations. W. & A. K. Johnston.
(5) Slate Paper Projection Atlas. Walker & Co.
(6) Slate Paper Outline Atlas. Walker & Co.
(7) Elements of Geography. Crosby Lockwood & Co.

German—
(1) German Phraseology. Crosby Lockwood & Co.
(2) German Prepositions. Crosby Lockwood & Co.

Grammar and Analysis—
(1) Heeley's Sentences for Analysis. W. & R. Chambers.

Kindergarten—
(1) Essays on the Kindergarten. Sonnenschein & Allen.

Latin—
(1) Creak's Dictionary of Cæsar's Gallic War. Hodder & Stoughton.

Music—
(1) The Old Notation Modulator, and how to use it. Pitman.
(2) Song, 'The Statesmen of England.' Pitman.
(3) Union School Singing Book. Gall & Inglis.
(4) First Lessons in Singing. Gall & Inglis.

Reading—
(1) Morrison's Literary Reader. Gall & Inglis.
(2) Morrison's First Geographical Reader. Gall & Inglis.
(3) Morrison's British Readers, Standards I. III. and VI. Gall & Inglis.
(4) Geographical Reader for Standard III. Stewart & Co.
(5) Geographical Reader for Standard III. W. & R. Chambers.

Science—
(1) Scientific Industries Explained. W. & A. K. Johnston.

School Management—
(1) Notes of Lessons for Infants' Classes. Jarrold & Sons.

Theology—
(1) First Epistle to the Corinthians, with Explanatory Notes. Philip & Son.

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Publications Reviewed.

A Complete Dictionary of Cæsar's Gallic War. By Albert Creak, M.A. Price 2s. 6d. London: Hodder & Stoughton.

We notice the fifth edition of Mr. Creak's method of supplying what he deems to be a want sorely and widely felt. For such books we confess we have very little sympathy. We presume that even Mr. Creak thinks it an advantage that beginners in Latin should learn the faculty of discrimination as well as the translation of words that in the whole course of their classical career they may meet twice or thrice only, and then, as probably as not, if this semi-key system is adopted, not recognise. Yet the chief merit that the book professes, is to save the student the trouble, and, we may add, deprive him of the benefit, of independent choice. He looks out his word; as probably as not, especially if the passage presents even the slightest difficulty, his overjoyed eyes meet the whole phrase translated. If he fails in doing this, he cannot go far wrong: there are but two or three pits to tumble into; if he takes his choice, and the first, the chances are two to one that he could have done no better. And thus somehow, by pit-flounderings never extensive, by guesses unfailingly happy, he reaches the end, and has 'gone through Cæsar' about as successfully as that memorable undergraduate who got through it with a gimlet. Of course, we know that Mr. Creak has on his side the great authority of Dr. White, but to our mind nothing has yet justified or can ever succeed in entirely clearing plans of this sort from the opprobrium which inevitably and deservedly attaches to keys. Never yet has there been, never in the future will there be, any great scholar who frames his learning on the principle of learning nothing about a word but its particular application. Of course there are some by whom this work will be hailed as a godsend, but they are chiefly confined to the superficial class of students, who imagine that the chief end of examinations is to escape being plucked.

Not even with the workmanship are we entirely satisfied. We seek a favourite catchword with examiners; we find 'Commeatus, n. 4, m (commeo),' etc. We track it up: 'Commeo, v. 1 (conmeo).' And there we must stop. In no place do we find a hint that *meo* and *eo* are not far different; *meo* is, of course, not mentioned as a separate head

No derivation is given for 'provincia;' yet we have known it asked several times, even from 'young learners.' If it is pleaded that this book is not intended for such information, we turn to the Druids: 'Two derivations are given, one from the Greek δρῦς, *an oak*; the other from the Celtic *der*, an oak, *wydd*, mistletoe, and *dyn*, a man.' Surely 'young learners' would be much more edified by knowing why the Great Bear should be called *Septentriones*, or that *castra* has a different meaning in the singular. This selective method leads to utterly false results at times; for instance, *provenio* is translated only by *yield*. Doubtless this is correct enough as far as Cæsar goes, but at the same time a far commoner meaning is *to prosper*, which is almost diametrically opposed to the meaning given. Only once, as far as our investigations have extended, is Mr. Creak positively faulty, and that is in the uses of *in*, under which head he gives translations which are not only misleading, but even at times quite mistaken.

At the same time, to students whose only object in reading Latin is to enjoy the commentaries, the book will prove eminently useful. The phrase lists and translation hints are very good, and in every case, we believe, modern names of places are given where they are known. Thus in a sense Mr. Creak may be said to have entirely succeeded in his attempt.

Sentences for Analysis for Use in Schools. Selected by J. H. Heeley, B.A. (Lond.). 32 pp. fcp. 8vo. Price 3d. London and Edinburgh: W. & R. Chambers.

We are glad to be able to give this book hearty praise. In a preliminary notice Mr. Heeley thus sets forth his aim:—

'Teachers have often found that the examples for analysis in the grammars are not sufficiently numerous, and are soon worked out. The following selection is intended to be placed in the hands of pupils, and its use in that way will prevent (1) the trouble to teachers of selecting sentences; (2) the errors of pupils in copying the given sentence; (3) the copying of one pupil from another, as each can do a different example.'

The selection, which includes poetry and prose from our best standard writers, shows excellent judgment. Pupil teachers, and indeed all who 'go in' for the University Local Examinations, will find these 'Sentences for Analysis' a valuable preparation for the work of the examination room.

Pupil Teachers' Examination Papers for 1880. By A. Park, F.R.G.S., etc. 196 pp. cr. 8vo. Price 2s. John Heywood.

Mr. Heywood the publisher, and Mr. Park the editor, are to be congratulated on the timely issue of this serviceable volume. No pupil teacher anxious to excel at his annual examination should be without these 'Papers,' and no head teacher desirous of economizing his time and familiarizing his assistants with the peculiar kind of questions set by the Education Department should fail to use them. Overworked teachers will know how to value the answers to Arithmetic, Algebra, Grammar, Euclid, and Mensuration.

The book is well and strongly bound, and costs but a florin.

Scientific Industries Explained. By A. Watt. 203 pp. cr. 8vo. Price 2s. 6d. London and Edinburgh: W. & A. K. Johnston.

When we opened this book a few evenings ago in the quiet of our little study, we fell into a reverie. We were carried back to the days—now, alas, far gone—when in the dimly-lit lecture hall of our Alma-mater we were, though ill in health, 'doing' our 'Certificate' papers. One of the questions in the school Management Section was on 'Candles.' Not having enjoyed the advantages of a close residence to a tallow-chandler's works, we knew but little about the manufacture of stearine, composite, paraffine, wax, and dip candles, so passed on to the next question. We should, however, have had full marks if we had read this book. Its object is 'to give an insight into the scientific industries of our country, in a simple and easily understood form;' and that object has been attained in a thoroughly interesting manner. Teachers in outlying districts, where strict economy has to be practised, will get much useful information from this volume, the recipes for making the various kinds of 'ink' being specially valuable. The book is readable, and discusses bleaching, dyeing, soap-making, paper-making, gunpowder, vinegar-making, electric-lighting, photography, fireworks, and numerous other 'industries.'

In the majority of well-conducted schools there is now a pupil teachers' reference library. We hope that when our readers are filling up their next order form, they will not forget *Watt's Scientific Industries Explained*, 2s. 6d. (Johnston). They will thank us for the reminder.

Johnston's Series of Maps of Ancient Geography: Maps to illustrate Cæsar De Bello Gallico. Mounted on rollers, 21s., with Handbook. London and Edinburgh: W. & A. K. Johnston.

We confess ourselves rather disappointed with this part of the above valuable series. Perhaps we expected too much, but at all events our anticipations are very far from being realised. The colouring is scarcely up to Messrs. Johnston's usual high standard of excellence, though the maps are clear and not encumbered with too many names. The intention is to illustrate Cæsar's *Commentaries*, which are now rising into such great popularity as means of elementary Latin instruction that they certainly need something more than a few scattered notes or a dictionary. The tribes mentioned are all duly inserted, and comically enough definite boundaries given to their territories. This latter piece of work is of course, from beginning to end, pure imagination, and should scarcely have been perpetrated without some caution to this effect, to young students who, unless warned, are apt to endeavour to fix in their memory, on the same level as the positions of well-known places, the amusingly wavy and wavering lines, by means of which the ancient geographer intends to represent where he supposes that one country may have ended and another begun. Under the same head comes our objection to the printing, which in a map is so important a factor, and has hitherto in Johnston's series been so admirably managed. More varieties of type should have been introduced. As it is, a hamlet like Carcaso stands on a level with Alesia, Narbo, and Lutetia. And creatures, who but for some unfortunate freak of chance would never have crept into history,—the Siburates, Crocosates, and Diablintes, for instance,—are distinguished from really powerful nations such as the Ædui, Arverni, or Helvetii, either by putting the letters of the same size farther apart, and thereby rendering them less distinguishable, or by making the inferiority and incapacity of a state vary directly with the blackness of the letters by which it is designated.

As to the geographical accuracy of the work, it is sufficient to state the name of its publishers, and add that in general the compiler seems to have followed a standard authority on such points, Dr. Heinrich Kiepert of Berlin. We note, however, one slight exception: Aquitania certainly includes the Pictones, Bituriges, Arverni, and Segusiani, the small district between the Garonne and Pyrenees being Aquitania Propria.

Notwithstanding these faults, Messrs. Johnston have supplied a great want. So far as we know, this wall map is the best yet issued, of this district.

It is accompanied by a handbook. We have space only for one or two suggestions, which, if adopted in future issues, would in our opinion render this small manual invaluable to all young students. We recommend, then, that Britain, the mention of which must always to us be the most interesting part of Cæsar's narrative, should occupy considerably more than half a page, and more particularly that the modern names of tribes, towns, etc., should be given in all cases where they are known. Who can doubt, for instance, that the position of the Parisii would be accurately known if it had been hinted that Paris takes its name from them?

If any detached notes, such as the one on 'suppli-

catio,' are deemed advisable, it would certainly be well to add to their number others on 'castra' and 'exercitus.' They would, so far as we see, bear quite as much on geography as does the present.

Arithmetic, Parts I. II. III., Integral, Fractional, Approximate. By A. Sonnenschein and H. A. Nesbitt, M.A. Price 5s. Sonnenschein & Allen, London.

We scarcely remember any book on Elementary Mathematics which has pleased us so much as the one now before us. The authors, one of them at least, are pupils of De Morgan, and his genius has left its stamp on every page. Even in the method by which children are taught to count, we have something showing originality. In italics we are told that to say 'two and two makes four' is a very ruinous process, and whether we agree to this axiom or not, every one will admit that our authors' method is very far more rational and infinitely more interesting than the humdrum monotony of that of so many schools of the present day. But there are other innovations even more important. The fickle and ever-changing boundary line between Arithmetic and Arithmetical Algebra is altogether and very rightly swept away. The learner feels at once that his symbols represent real things, that 3 is really something more than two twirls, two tails, and a projection in the middle, and has a definite meaning which in every operation it still keeps. Looked at in this light, there is no difference between the two sciences; *a* and 3 are both symbols in the same sense. We feel convinced that this work will ultimately do much to revolutionize the method of teaching Arithmetic. So far as we have examined it, the results are accurate, and we may state that *Stocks* are well and clearly treated, without making such a great gap as is usual between them and *Interest*. Abbreviations, even to the extent of 'casting out *elevens*,' are clearly and ably presented, though, as in the instance we mention, some may perhaps be dubiously shorter.

This book, we repeat, is a capital work, and cannot fail to be eminently useful.

A Student's Handbook of Psychology and Ethics. By F. Ryland, M.A. Price 2s. 6d. London: Sonnenschein & Allen.

Mr. Ryland's summary of Psychology and Ethics well deserves to become popular. It is designed for the London Examinations, but that by no means makes it an uninteresting catalogue of facts, nor does it in any degree detract from its general value. The author proposes to guide the student through the mazes in which this science, far more than any other, is involved, pointing out the best books, showing where each one is faulty, *summarizing* the important features, and thus presenting them in a form easy to retain in the memory, and especially convenient for reference. At least one-half of the work is taken up in analyses and quotations from Herbert Spencer, Stuart Mill, or Professor Bain, and by this means the student is provided with a pleasant introduction to the gigantic literature of the subject. If this book should reach another edition, and we hope that several will be called for, we think that a Physiological Glossary, which need not take more than a page, accompanied with diagrams of the organs of sensation, would be a vast improvement. More examination papers might be added; and we do not think it wise, in giving these as specimens, to quote selected questions only. If complete years had been given, any one could have seen at once that this book contained amply enough to satisfy the hardest requirements for the B.A. degree.

As for the subject-matter, we have very little comment to make; so much, indeed, does our author shine by reflected light, that very little is possible. In one place he quotes from Huxley's *Hume* an argument in defence of the Evolution of Mind. This is a resort of materialistic evolutionists which has been lately battered so much as rather to resemble a hovel than a refuge for any Christian psychologist who keeps his senses about him.

The science of Ethics is as well treated as that of Psychology; and so, without the slightest reservation, we have great pleasure in recommending this book. Mr. Ryland has done his work well.

Spence's Civil Service Geography. 144 pp. fcap. 8vo. 2s. 6d. Crosby Lockwood & Co.

We were familiar with this compact volume long before it was sent to us for review. For some time we had used it with satisfactory results. Our approval has evidently been shared by many others, for we notice the book has reached its *seventh* edition.

It is pre-eminently an Examination Geography, and contains within its pages as much well-arranged, accurate geographical information as any one needs for an examination of ordinary difficulty. A series of attractive maps and a carefully-prepared index enhance the value of the book. We have pleasure in commending it to our young pupil teachers in quest of a good, cheap, handy text-book.

Morrison's First British Reader.			6d.
,,	**Third**	,, ,,	1s.
,,	**Sixth**	,, ,,	2s. 6d.
,,	**Literary Reader.**		1s. 3d.

London and Edinburgh: Gall & Inglis.

Had the wise man who penned the words, 'Of the making of books there is no end,' lived in our day, he might with reason have varied his remark and said, 'Of the making of *Reading* Books there is no end.' What, another new set! Yes, and a good one too.

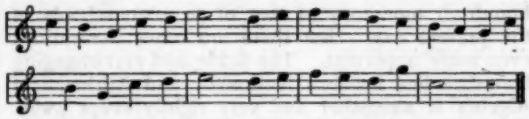
It would be a pleasant duty to write a page on the merits of this excellent series, but we forbear, owing to the pressure on our space. To be brief, we have examined with care every reading book of recent date, and among the vast number there are none, judged from a practical teacher's point of view, we prefer to Morrison's 'British Readers.'

Wareham's Method of Teaching Sight-Singing by means of the Old Notation, Modulator, and Time-Tables. London: Pitman, 20 Paternoster Row.

The title of this book we have given in full as explanatory of the author's design. Teachers who are familiar with the modulator of the Tonic Sol-Fa system will be prepared for a perpendicular columnar arrangement, combining the most salient features of the diatonic and chromatic scales. By this the principles of modulation are illustrated, and useful occasional exercises given in *hitting*—as vocalists term it—*any distance*, or in other words, taking correctly any interval of the chromatic scale. When this scale should

be used by trained singers, and how far beginners, such as ordinary pupils of our elementary schools, should proceed before having to sing exercises from modulators, is open to discussion. Mr. Wareham's modulator, however, does not profess to combine the chromatic with the diatonic scale, but is simply a perpendicular arrangement of the enlarged black dots which form the body of crotchets and quavers in two columns on the ordinary treble and bass staves. In this a separate modulator has to be used for every key. The reading of the author's preface induced us to hope for great things. He speaks so confidently of his method from 'experience,' as to be certain that 'the whole system, with a thorough and practical knowledge of notation, may, with the devotion of one hour a week, be imparted to and acquired by children during the school age.'

We look with pardonable eagerness to Mr. Wareham's book to discover the details of a method capable of producing such remarkable results. What do we find? Nothing that we have particularly to complain of, but still less to justify such very large pretensions. We look at first to Mr. Wareham's modulator, and fail to see in the double columns of notes any remarkable features. The double columns are employed by the author for 'compactness,' and yet 'to avoid the too close, and therefore confused appearance a single column would present.' We can hardly understand this. We commonly understand compactness not being antagonistic to a close arrangement. But to us the dodging from one column to another would produce rather than avoid 'confusion.' This double column modulator can hardly be capable of producing such wonderful results. Nor can the preliminary exercise of the major scale, 'to be sung by ear without the modulator,' be thus credited. Nor can the singing of the common chord, together with the frequent repetition of the tonic, be the grand principle. In short, we fail to find any leading feature calculated to produce more than ordinary results. But while there is disappointment in the absence of peculiar excellences, there are serious defects in the unwise introduction of difficulties in the early stages of a course professedly intended for youthful scholars. Mr. Wareham adopts the nomenclature proposed to be applied to the present Italian syllables, in order to indicate the sharpening or flattening of intervals. This nomenclature is far from being settled, and, by its advocates among the Tonic Sol-Fa adherents is yet disputed, as appears in the last number of the *Tonic Sol-Fa Reporter*. Dr. Hullah's proposal to give a new name to the various intervals of the chromatic scale was, we fondly hoped, abandoned. But the complexities of naming chromatic intervals according to fancied changes of key is something to be dreaded, especially as being associated with systems professedly formed to *simplify* musical notation. This change of key, again, is by no means always easy to determine, nor settled by the changed prefix of initial letters. It seems far from settled whether harmony and the progression of other parts is to be ignored in settling key relationship. This, however, we do not urge against Mr. Wareham's method. All we complain of in regard to his book is that he thrusts forward this by no means easy matter of key relationship in the foreground for smoothing the path of young beginners. We may hereafter revert to this point, but proceed to notice some other matters that seem to be both vague and erroneous. Speaking of the tonic or key-note, Mr. Wareham regards the power of this note not owing to its melodious association with other notes, but by being itself strongly impressed upon the ear. 'Thoroughly impress,' he says, 'any note upon the ear, and all others will bear their proper relation to, and will circle round about it.' A drum resolutely beaten for some time and the prolonged tolling of a bell would certainly impress—we had almost said *din*—their respective monotones into the ear, but we never yet knew that they exercised any other influence upon the ear in regard to the scale, or 'caused other notes to circle round' the said monotone. Nor does the 'contrast' between the tonic and sub-tonic always exist so as to render the ear dissatisfied when it is not resolved upon—*i.e.*, does not ascend to the tonic. Take the following well-known example of one of Beethoven's most remarkable melodies :—



Here the leading note occurs three times in this beautiful strain, and in no instance ascends to the tonic. Many of these fanciful theories of key-relationship, the peculiar mental effect of certain tones in the scale, if not left to occupy debateable ground, should not be introduced into elementary lessons for children, especially in systems professedly aiming at simplifying musical notation.

We have alluded to the extensive nomenclature of intervals being a hindrance and not a help to correct music reading, and have to apply the same objection to Mr. Wareham's *Time Exercises*. These are correctly enough given, and form a succinct view of musical time notation. But after the pupil has mastered the respective values of minims, crotchets, and the rest, together with the leading modes of time and the corresponding signatures, he has by dint of hard practice to get the mechanical swing or movement of time into his head, so that every note may be associated with its relative length. All this is hard enough, simple though it may appear, and the difficulty consists in the mental effort involved in attending to two things at once, *i.e.* the mechanical clock-like progress of the time, together with the sign or form of the note. But Mr. Wareham adds another difficulty in the shape of a new time name. He recommends the naming of the first beat *Tra*, the second *La*, the third *Ta*, and so on. This is a more objectionable hobby-horse than that of Dr. Hullah in his directions on beating time, given some forty years ago on introducing Wilhelm's system. Pupils were puzzled to remember, and annoyed when they forgot, whether the second beat was from left to right or from right to left. Need we say it was utterly needless for them to remember? The mechanical beat of the old singers by their feet on the floor or simple movement of the hands was all that was needful. The more simple these matters are kept the better. To attend to a multiplicity of names diverts the mind from its main business in music, *to attend to tone and time*. We have something to say against the exclusive attention to the synthetical plan of teaching music, and the ignoring of

the analytical. We are not sure whether children ought not to be allowed, encouraged, yea, taught to sing without always insisting that they should do this from musical notation. We do not prohibit children from speaking before they have learned to read, nor need we dread their singing before they know their notes and can read all the intervals of the chromatic scale from modulators. A class of boys was drilled in the *crotch, crotch, crotch* of Hullah's system in the heyday of its popularity. One of the committee of the school witnessed the lesson, and being possibly as tired as the boys were, went out of school with them at noon. As soon as the boys were free, they trotted merrily along the path singing not Do, Re, Mi, nor *crotch, crotch, crotch*, but to the Committee man's horror, a lively strain to the words 'Hey jim along, jim along Josey!' The master was duly informed of this depravity, but failing to see the enormity of the procedure, he, the master, gave the boys a vocal exercise founded on the strain of the song in question. The boys listened, became greatly interested, and entered into the exercise *con amore*. The singing was from that time a success. The boys soon understood the leading points of musical notation, and the lessons afterwards given from the best of well-known popular melodies were always most popular. In regard to time exercises, one useful plan is to set part of the class to sing by counting, while the others sing the music to the words. This may also be varied by the strains being simultaneously sol-fa'd while also sung to the words to which it is set. As, however, our object is not now to propound plans, but to examine those in the book before us, we refrain; and while commending the author for great ingenuity and earnestness, regret that he has attempted too much, and by the introduction of neeedless topics and unseasonable difficulties, added to rather than lessened the obstacles to the acquisition of music by young scholars.

Popular Lessons on Cookery. By a Former Staff Teacher of the National Training School of Cookery. 186 pp. fcp. 8vo. Price 1s. 6d. London: Griffith & Farran.

There are so many cookery books—good and otherwise—already in the market, that we must own to some feeling of suspicion when this new candidate for public favour was put into our hands. Upon examining the book, our confidence was, however, soon established, for the lady—we presume the work is not a gentleman's—who wrote it evidently knows her work well. In a short sensible preface she says: 'This book professes to be nothing more than a faithful transcript of demonstration lessons given in various parts of London, its suburbs, and the country.'

In a threefold sense it is popular—firstly, because the book is divided into two sections, the former being devoted to 'Plain,' and the latter to 'High Class' Cookery, thus rendering it valuable alike to rich and poor; secondly, because it is written in a terse simple style within the grasp of the unlettered; and thirdly, because it is cheap.

The ten lessons which form the 'Plain' Cookery sections are:—

1. Roasting, and puddings generally eaten with meat.
2. What to do with the cold meat.
3. Boiling meat, tripe, vegetables.
4. Soups and stews.
5. Frying and broiling.
6. Pies and puddings.
7. Cheap dishes.
8. Fish.
9. Bread and cakes.
10. Cookery for the sick and convalescent.

The remarks on 'What to do with the cold meat,' 'Cheap dishes,' and 'Baking bread,' are admirable.

We strongly recommend the work. It will make a cheap and excellent gift-book. Messrs. Griffith & Farran have sent it forth in a neat and attractive binding.

The Statistical Atlas of England, Scotland, and Ireland. Edited by G. Phillips Bevan, F.S.S., F.G.S., etc. Part II., Educational. Price 7s. 6d.

This publication furnishes an instance of an admirable idea admirably carried out. Almost every kind of educational statistics is here tabulated. The arrangement is perfect, and reflects the highest credit on Mr. Bevan, the editor.

Not a whit less praise is due to the publishers. The three maps of England, Scotland, and Ireland (on each of which appears a neat plan of the capital of the country) are excellent specimens of the lithographer's art. This valuable *résumé* of educational statistics deserves a wide circulation.

A Short and Easy Practical French Verb-Book. By A. Antoine. 40 pp. fcp. 8vo. Price 6d. London: Joseph Hughes. 1881.

M. Antoine has in this very neatly-bound manual of forty pages attempted to give a sufficient account of French verbs, 'the backbone of the language.' We are not altogether of the opinion that he has succeeded. The omissions are many, and in some places serious; the English often execrable, and the French by no means perfect. We first have the conjugation of *avoir* and *être* in full, then regular verbs are considered, and remarks usually sensible, but *never complete*, are made on various irregularities, such as verbs in *-eler, -eter*. Thus far the book is well-nigh perfect, except that we should have preferred to see *béni, bénit* with their accents. Then it is that we are plunged headlong into confusion. The irregular verbs are jumbled together with scarcely a sign of order, except a poor pretence at classification which will sometimes lead the learner into great mistakes. For instance, *taire* and *plaire* are given together, whereas the past participle of *taire* is *tû*, that of *plaire, plu*. Circumflex accents M. Antoine has been extremely careless about. They seem to be quite at a discount with him. Even with a cursory inspection we find *éclot, éclora, écloront, écloraient, mu*, etc. Throughout we detect what must either be culpable neglect or superb scorn for small points. *Echoir* is impersonal through its very meaning, and yet we find *j'échus* given. We defy M. Antoine to give us the meaning of 'I fall due.'

We might pick many other holes in this work. A rule far too broad is given for distinguishing *croître* and *croire*. We have detected four mistakes in the list of verbs which follow *conduire*. Other parts are finished in a similarly slovenly fashion. But we have said enough surely to convince even the author that the

book is not perfect. Had a tabular form been adopted for the irregular verbs, fully annotated where necessary, its compass would have been considerably less than thirty pages, and it would have been proportionately more valuable.

We would recommend also more attention to details, and finally remind the author that it is possible to know French far too well to be able to write a book on French Grammar, especially if the difference between the idioms of the two languages has not been fully grasped.

Engagements for April.

April 1.	Philological Society, 'Parts of Speech,' etc., H. Sweet, M.A.; and 'Lowland Scotch Place Names,' Walter Brown, M.A.,	8 p.m.
	Royal Institution, 'The King in his Relation to Early Civil Justice,'	8 p.m.
	Carlyle Club (Bridge House Hotel),	8 p.m.
4.	Victoria Institute, 'The Visible Universe.' Professor Balfour Stewart, F.R.S.,	8 p.m.
	Medical Society,	8.30 ,,
5.	Society of Arts, 'Trade Relations between Great Britain and her Dependencies.' William Westgarth,	8 p.m.
	Teachers' Investment Society.	
6.	Geological Society,	8 p.m.
	Ascham Society, 'Spelling Reform.' J. Fenton, Esq.,	8.30 ,,
	Dialectical Society, 'Crimes and Punishments.' H. Nillosby, Esq.,	8 p.m.
7.	Society of Arts, Applied Chemistry and Physics Section,	8 p.m.
	Archæological Institute,	4 p.m.
	Linnean Society,	8 p.m.
8.	Royal Institution, 'Conversion of Radiant Heat into Sound.' Professor Tyndall, D.C.L., F.R.S., M.R.I.,	8 p.m.
	Royal Astronomical Society,	8 p.m.
	New Shakspere Society, I. 'Shakspere's Old Men,' Miss Constance O'Brien; II. 'Was Shakspere a Democrat?' Miss Emma Phipson,	8 p.m.
11.	Geographical Society,	8.30 ,,
	Candidates' Examination at South Kensington. (Apply on Form 325 before April 15.)	
	Medical Society,	8.30 ,,
12.	Anthropological Institute,	8 p.m.
14.	Last Day for Science and Art, Form 325.	
18.	London, Conference of N.U.E.T.	
21.	Linnean Society,	8 p.m.
22.	Ascham Society, 'Science Culture for the Young.' D. Andrew Wilson, F.R.S.E.,	8.30 ,,
25.	St. Mark's College Anniversary.	
	Medical Society,	8.30 ,,
26.	Anthropological Society,	8 p.m.
27.	Geological Society,	8 p.m.
	Annual Meeting of London Institution.	
29.	Society of Arts, Indian Section,	8 p.m.

Monthly Notes.

EDUCATION IN PARLIAMENT.—The present state of things is not favourable to the bestowment of much consideration on Educational matters in Parliament. There are at the present time three Bills dealing with such matters which have passed the first reading in the House of Commons. One, The Education Endowments (Scotland) Bill, is a Government measure. It is substantially identical with that introduced last session under the same title. The only difference relates to certain provisions contained in the former with regard to Heriot's Hospital, which met with such vigorous opposition from the governors of that body, and from the inhabitants of Edinburgh generally, that they had to be withdrawn. The main object of the measure is to secure the more efficient employment of educational endowments for the purposes of secondary education in that portion of the United Kingdom. This being a Government measure, and being approved of by the Scotch members generally, it is possible that it may pass during the present session. Another Bill is that introduced by Sir John Lubbock, The Teachers' Registration Bill. Should an opportunity be secured to propose its second reading, it will receive the determined opposition of the National Union of Elementary Teachers, on account of its non-inclusion of certified elementary teachers in the register which it proposes to establish. The third Bill is one entitled, The Free Education (Scotland) Bill, and is introduced by Dr. Cameron, one of the members for the city of Glasgow. It is down for the second reading on the 18th of May. Whether that day will bring the opportunity remains to be seen. As to the fate which such a Bill will receive at the hands of the present Parliament, there is no room for doubt. In consequence of what may be called the provisional character of the Education Code for the present year, it has been allowed to pass without challenge. The proposed educational grant for the year ending March 31, 1882, is £2,683,058, being an increase of £178,998 over the rate of last year. The estimated average attendance at elementary schools in England and Wales is very nearly 3,000,000. For these the portion of the grant provided is £2,362,142. The rest of the vote is apportioned to education in Scotland, to Science and Art, to inspection and other working expenses of the Department. Several notices have been given of motions to be proposed on the introduction of the Education Estimates. One of these is by Colonel Barne, to the effect that a larger proportion of the expense of elementary schools should be defrayed from the Imperial Exchequer. Attention is to be called, too, by Mr. Meldon, we believe, to a recent circular issued by the Education Commissioners in Ireland with respect to the teaching of agriculture in elementary schools in the rural districts. The teachers complain that it is unjust that those of them who are themselves without agricultural training should not only be required to teach agriculture, but should be subjected to deductions from their ordinary and result fees on account of their pupils failing to pass in this subject. The Education Estimates have not come on at the time of writing, but there is no difficulty in anticipating the fate of Colonel Barne's motion at least.

The Senate of the Irish University has just completed a scheme of that Institution which will also need to be submitted to the consideration of Parliament when opportunity offers. According to the *Times*, the Senate has, in the main, taken as its model the existing Queen's University which the new University is to supersede. The principal innovation proposed is the admission of women to degrees on equal terms with the other sex, a separate time

for examination being appointed. The machinery cannot, however, be put in motion without a grant of money, and so this, too, must remain *in statu quo* until Parliament can afford time to attend to such matters. In a similar position is the Report of the Commission on Intermediate and Higher Education in Wales, and the recommendations which that Commission may see meet to submit. Mr. Mundella, in reply to a question by Sir Robert Cunliffe, one of the Welsh members, has stated that he was afraid that he could not hold out the hope that these could be considered by the House during the present session.

THE SCHOOL BOARD FOR LONDON.—The subjects which have chiefly occupied the attention of the School Board for London during the past weeks, besides its routine business, have been Corporal Punishment, and the Eligibility of Women as School Inspectors. The former subject was introduced by Mr. Heller, who proposed that the present rule of the Board, which permits corporal punishment to be inflicted only after school hours, should be repealed, and that on this point teachers should be left to their own discretion. The previous question was moved by Miss Helen Taylor, and after a very full and sometimes warm discussion, this was adopted by 21 against 15.

The other question was introduced in connection with a resolution of the Board to appoint an additional (a seventh) Inspector of its schools. The motion that in the advertisement for candidates it be stated that a woman is eligible, ultimately proposed by the School Management Committee, to whom the question had been referred, was carried—only by the casting vote of the chairman, however, 20 voting for and 20 against. The Hon. Lyulph Stanley, M.P., has given notice that he will move to rescind the motion carried by the casting vote of the chairman. A very elaborate and carefully-prepared Report has been produced by the Endowments Committee of the Board concerning the Charity Endowments in possession of the Guilds of the City of London. One of the conclusions of the Committee is that of these funds upwards of £100,000 per annum ought fairly to be available for the purposes of education.

THE NATIONAL UNION OF ELEMENTARY TEACHERS.—The Executive of this body is busy preparing for its annual conference, which is held this year in London, during Easter week as usual.

It has resolved to endeavour to induce some eminent educationalists outside of the Union to read papers on the following three subjects:—(1) Sir John Lubbock's Bill on Registration; (2) The Past and Future Policy of the Union; and (3) Charter of Incorporation for the National Union of Elementary Teachers. Mr. Matthew Arnold, Sir John Lubbock, M.P., and Sir U. Kay Shuttleworth have been requested to write papers on one or other of these subjects. An advanced party is being or has been formed in connection with the National Union of Elementary Teachers. The members of this party avow their belief that the Union moves too slowly towards the attainment of its objects. They declare themselves thoroughly loyal to the Union, and instead of quitting it because they think it does not accomplish enough, they are determined to do what in them lies to make it accomplish more. With this object in view a provisional Committee drew up the following draft programme:—

1. To strengthen the Union and promote the more rapid attainment of its objects by—
   - (*a*) Increased subscription.
   - (*b*) Restriction of membership to those who are or have been teachers in public elementary schools.
   - (*c*) Open reporting of Executive meetings.
   - (*d*) Reform in the mode of election of and representation on the Executive.
   - (*e*) Efficient control of Local Associations by the Executive.
   - (*f*) Making the office staff efficient.
2. To raise education.
3. To regulate the supply of teachers.
4. To improve the mode of certifying teachers.
5. To obtain Parliamentary representation.
6. To instruct the public on educational matters.
7. To resist oppression.

This programme was duly considered, discussed, and unanimously adopted at a general gathering of those members of the Union who are favourable to the formation of an advanced party, which met on the 19th March.

THE EDUCATIONAL CLAIMS OF WOMEN.—A congregation was held at Cambridge University on the 24th of February, for the purpose of presenting and voting upon the Report of the Syndicate, which recommended the admission to the 'Previous' and Tripos Examinations of all female students who had fulfilled the conditions as to the length of residence and standing required of the male members of the University, the residence to be either at Girton or Newnham College, or within the precincts of the University under the regulations of one of the Colleges. Grace No. 1, adopting the principle of this Report, was carried by a majority of 398 against 32. Paragraph 8 in the Report, which proposed 'that in each class of female students in which the names are arranged in the order of merit, the place which each of such students would have occupied in the corresponding class of members of the University shall be indicated,' was adopted by a like majority; and all opposition to further portions of the Report was abandoned as hopeless. This success is said to have surpassed the most sanguine anticipations of the ladies and the supporters of their claims.

THE GOFFIN CASE.—This case reached what will probably be its final stage on February the 25th, when judgment was given against Mr. Goffin, the plaintiff, in the High Court of Justice, Queen's Bench Division. The origin of the case was a charge by Col. Donnelly, of the Science Department, against Mr. Goffin, who is head master of the United Westminster Schools, of having improperly obtained, beforehand, knowledge of the Chemistry questions, and of using that knowledge in preparing his pupils for examination. In consequence of this charge the Science and Art Department suspended Mr. Goffin's certificates, and intimated to the governors of the school that no more grants would be given for pupils instructed by Mr. Goffin. The governors carefully examined the facts of the case, and unanimously decided that Mr. Goffin was innocent, and determined to maintain him in his position as head master of the Westminster United Schools. Subsequently, chiefly through the efforts of the National Union of Elementary Teachers, a Select Committee of the House of Commons was appointed to investigate the facts of the case. This Committee

decided in favour of the Department, and drafted a report very adverse to Mr. Goffin. At this stage some of the parents of Mr. Goffin's pupils took up the case. They criticised with severity the constitution of the Select Committee, and pointed out that, though the Department was one of the parties in the case, yet the Vice-President not only nominated the members of the Select Committee, but himself sat as one of its members, and took the leading part in its proceedings. They also directed attention to the facts, that Mr. Goffin, though the accused, was not allowed to defend himself, and was only permitted to give evidence as a matter of favour; that the witnesses were not cross-examined; that the evidence was given in Mr. Goffin's absence; and that no rebutting evidence was allowed. The governors took the same view of the matter, and again decided that they could not in justice dismiss Mr. Goffin from his position as head master. They and Mr. Goffin's supporters maintained that, if the Department had sufficient evidence to justify their decision and that of the Select Committee, they should prosecute Mr. Goffin in a court of justice on a criminal charge. They refused to do this, or to take any action which might facilitate the procuring of a legal decision on the merits of the case. They suggested, however, that if Mr. Goffin were not satisfied, he might proceed against any of the witnesses for perjury. Hereupon the present action was begun. Mr. Goffin sought to proceed against Col. Donnelly for defamation. The defendant pleaded privilege, that no action could be brought against him for what he said in the capacity of a witness before a Committee of the House of Commons. Mr. Justice Field and Mr. Justice Manisty have decided that this plea is valid in law. And here we suppose the matter must end. Mr. Justice Field, in giving his decision, said: 'It is a bad thing, and a hard thing upon a private individual, that any body should be at liberty, anywhere, to say or impute to him by writing, or by word of mouth, things tending to his disparagement, or to his having committed a crime. And the law protects, *as far as it possibly can*, this right to the person so injured, to call upon his accusers to justify, by proving the truth of what he has said. But then, that interest, which is a very great and a very considerable one, is governed by a still greater interest. The greater interest is the necessary administration of law.' Of course, the principles involved in this case are of universal application, and of interest to all classes of the community. The case has, however, a special interest for teachers, not only because of its immediate bearing on the position of one member of the profession, but also because of the special relations which all teachers sustain towards the Education Department, and the consequent probability that any one of them may find himself, any day, in a position similar to that in which Mr. Goffin has been placed.

UNIVERSITY COLLEGE, LONDON.—The opening of new buildings in extension of this Institution was celebrated by a dinner on the 16th of February. A large number of eminent scholars and educationists were present. Earl Kimberley occupied the chair. The speakers, besides the chairman, were Lord Sherbrooke, Professors Tyndall, Morley, and Max Müller, Sir John Lubbock, M.P., and Sir F. Leighton. Lord Sherbrooke spoke of the tendency manifest at the present time to increase the quantity of instruction attempted to be imparted beyond the capacity of pupils to receive. His Lordship expressed the conviction, that in consequence of this the information acquired was often inexact, superficial, and useless, and strongly advised pupils and students to make a choice of subjects and see that what they did was well done.

OWENS COLLEGE, MANCHESTER.—The people of the north are showing characteristic public spirit and enterprise in connection with the new Victoria University and its affiliated Institutions. At a recent meeting of the Court of Governors of Owens College, plans were submitted for the extensions, which will cost about £40,000 to erect. It was unanimously resolved to proceed with these extensions, and a committee was appointed to carry out this resolution.

CITY AND GUILDS TECHNICAL INSTITUTE.—The annual meeting of this institution was held on Monday the 14th March—Sir S. H. Waterlow, treasurer, presiding. In a lengthened report which was presented, an account was given of the building which is to be erected at Kensington for the accommodation of the Institute, the estimated cost of which, including apparatus and furniture, is £76,000. Towards this sum £55,000 have been secured. Meanwhile the Council have empowered the executive committee to make arrangements for the erection forthwith of so much of the building as can be completed for this sum. During the past year 422 students have received instruction in physics and applied chemistry at the temporary class-rooms in Cowper Street, and 721 tickets have been sold at fees varying from 2s. 6d. to 7s. 6d. Arrangements have been made for extending the operations of the Institute to meet the increasing demand for instruction on the part of artisans both in the City and in South London. The Council state that no part of the Institute's operations has been more successful than that connected with the technological examinations. The total expenses of the Institute from February to December 1880 were £9473, 5s. 8d. The income for the year 1881 will be not less than £18,515.

IMPORTANT NOTICE.

As young students, especially those who read without a coach, frequently encounter difficulties in their studies, the Editor is pleased to announce that in future numbers of this journal there will be a 'Query' column. Any subscriber who has *bonâ fide* failed to solve a problem or question may have help *free of charge*. All communications for the 'Query' column must reach the office not later than the 15th of the month.

As many of our readers attend the May examinations of the Science and Art Department, the Editor is pleased to announce that in the next issue of this journal (published on April 27th) the questions set at the last examination in Stages I. and II. of Mathematics will be printed, with model answers to every question.

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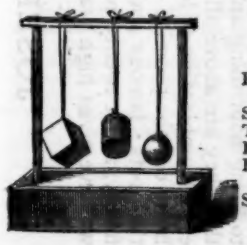

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